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EAST EUROPE REPORT

SCIENCE & TECHNOLOGY

CONTENTS

GERMAN DEMOCRATIC REPUBLIC

NEW TRENDS IN COMMUNICATIONS TECHNOLOGY

West Berlin FS ANALYSEN in German Vol 10 No 7, 1983 pp 71-110

[Lecture by Klaus Krakat at 9th Symposium of the Berlin Research Office on 18 Nov 83: "Development Trends of Communications Technology"]

[Text] New Communications Technologies in the GDR

1. Introductory Remarks

For some time, we have been increasingly confronted with new communications technologies, the so-called "new media"[1], their application opportunities and developmental trends. Their spectrum extends from the picture disk to satellite radio and video, video texts, as far as glass-fiber technology. More new techniques and communication services are also expected to be introduced in the Federal Republic of Germany. Because of this, it certainly seems of interest to investigate the relevant developmental situation and activities in the GDR.

Starting from the central position of modern technologies, within the economic strategy of the GDR for the 80's, and with the problems connected with implementation, we shall investigate not only projects under development and already implemented in the GDR, but also the activities of other CEMA countries, with a view to the introduction of "new media".

2. The Significance of New Technologies in the Concept of the GDR's Economic Policy

In April 1981, at the 10th Party Congress of the SED, the "economic strategy for the 80's" was set down in 10 points.[2] This strategy represents a self-sufficient conception for the organization of the planned economic development. It is directed to building the material-technical foundations for the entire economy from a qualitative perspective. A key role is here especially assigned to the accomplishment of scientific-technical progress. This should be achieved by increased development and application of microelectronics with perceptible breadth, by more intense use of EDP, and not least of all by means of industrial robot technology. These technologies are considered essential elements of the economic strategy and as principal factors in the desired qualitative economic growth. Consequently, the party and economic leadership of the GDR always presents them as the decisive foundations of the "struggle for highest production, efficiency, and quality". The state funding of new technologies, however, is not limited to microelectronics, EDP, and industrial robot technology. The funding of other technologies, especially those that are strongly influenced by microelectronics, is also connected with the required implementation of scientific-technical progress. Correspondingly, one will have to start from the idea that technological funding in the GDR will have to include especially those opportunities for increasing efficiency which guarantee the accomplishment of the economic strategy specified for the 80's. Among these, one will surely have to count new communication technologies.

Closely connected with these facts is the requirement of accomplishing innovative processes in the GDR by means of new ideas, an inventive spirit, a readiness to take risks, and a constant uncompromising comparison with the international technological level.

3. Problems in the Introduction and Implementatin of New Technologies in Previous Years

Plans and objectives whose focal point consists in the further development of scientific-technical progress on the basis of the most recent technologies as well as the overcoming of existing problems in scientific and technological development are nothing new in the GDR. In the past, precisely the industrial area of electrical engineering/electronics provides examples of this.

For example, around the middle of the 60's, the objectives of the electronics industry, which had become internationally sidetracked, had to be defined in detail by the ministerial council of the GDR. A complex of measures to clean up the component and EDP production, including the preceding research and development, did not lead to the long term expected successes, however, and the connection to an international top position ended in a visible time lag compared to Western industrial countries, despite major government activities. During the middle of the 60's, the third computer generation was already making its entry here; on the other hand, in the GDR, the first computers of the type Robotron 300, a representative of the second computer generation, were being installed beginning in 1967, in enterprises of structually determinative industrial branches. As regards its power, this Robotron computer corresponded to the IBM system 1400, which at this time, however, was already considered outmoded.[3]

As regards microelectronics, government and economic organizations initially were quite conservative. In the middle of the 70's, due to this conservatism, the impression was first given as if this technology did not exist at all. While microelectronics began to start a new phase of technological development in Western European countries, neither the directive concerning the five-year plan 1976-1980 nor the promulgated law concerning this five-year plan contained specific directives concerning planned developments.[4] Only after 1976, surely also under the impression of stormy development of microelectronics in the West, were first measures initiated to introduce this new technology. The mastery and implementation of microelectronics were now raised to a core question of further scientific-technological development.[5] The actual starting shot for the formation of the microelectronics industry in the GDR, however, was only fired upon the complete restructuring of the electrical engineering/electronics industrial area and with the founding of the Erfurt microelectronics combine, which occupies the center position of this area, and the formation of other combines relevant to microelectronics, all at the beginning of 1978.[6] Because its reaction to international developmental trends was too slow, and because the available production facilities were relatively inadequate, the GDR had again placed itself in the position of technological catch-up. Despite variaous development successes in the area of microelectronics and EDP, even within the GDR itself, the attained level and the previous developmental tempo are still not regarded as adequate in comparison to the international status. Thus the economist Koziolek in his lecture at the Seventh Scientific Congress "Mathematics and Cybernetics in the Economy" in October 1982 emphasized that "important results in certain areas and in individual branches of the international economy..., the achieved level and the broad effectiveness of mathematics and computer technology in the national economy of the GDR,

are in no way satisfactory as measured against the international top level and against the criteria of the economic strategy of the SED for the 80's. The main problem in this area is a lack of breadth."[7] Beyond this, there also seems to be much difficulty in keeping step with international developments in microelectronics.[8]

4. Does the Planned Economy Inhibit the Innovative Process?

Such development situations, as we have indicated by two examples in the area of electronics, make clear that, precisely in centrally managed economies of the Soviet type, problems occur again and again in the implementation of scientific-technical progress, which up to now could not be overcome either by decisions of the ministerial council nor by specific legal ordinances. As Leipold most recently observed in this connection, the thesis of the innovative inertia of centrally planned economies, as this thesis is defended precisely by Western economists, is based particularly in institutional as well as in motivational deficiencies.[9] it is undisputed that precisely the phase of transferring scientific information into production is the weakest link within the chain of "scientific-technical-production". In this phase, as Nick et al. also observe, the lag compared to the practice of leading Western industrial countries, appears most clearly.[10] Under the impression of the misdevelopments and problems which appear again and again in the implementation of scientific-technical progress, and in view of the manifold transformations, especially those that are induced by microelectronics, criticisms already were being voiced in the 70's. The center point of these criticisms was, among other things, the innovate inertia, the lack of readiness to take risks, and the low scientific-technical standards in the GDR. Günter Mittag, as Secretary of the Central Committee of the SED, was indeed well acquainted with the situation in this sector. Like other leading party functionaries before him, he imposed the requirement,"to achieve better performance, which would make it possible to codetermine the internationa status".[11] Again, Nick observed that "the fraction of truly new developments was supposedly relatively small."[12] As he emphasized, what is involved is not "more or less random top achievements in connection with individual products, which are the result of more or less random discoveries and inventions. The task is more complicated: What is involved are permanent peak positions in certain areas of production."[13] With reference to the existing innovative weakness in the GDR, Mittag observed: "The method 'one waits for the other' can no longer be tolerated. It does not bring us forwards, but only throws us backward."[14]

Since the beginning of the 80's, criticism grew concerning difficulties which had not yet been cleared up, especially from the ranks of the non-GDR scientists. Thus, the Vice-President of the East Berlin Office for Inventions and Patents, Mr. Janke, expressed himself very critically as regards the level of inventions in the GDR. According to his estimate, some of the inventions were of such a low level that their utilization by industry was not supposed to be justified. Another portion of the inventions also reportedly remains unused because the achieved research results do not correspond to the needs and cricumstances of industry.[15] The renowned Dresden research professor von Ardenne, in 1982, published a paper with the criticism

that many scientific-technical peak performances that were propagandized in the GDR really were not peak performances at all, but only normal further developments of the "technology along foreseeable tracks".[16] The president of the Academy of Scineces of the GDR, Professor Scheler, stated that the formation of the combines between 1978 and 1980 "created basically better presuppositions for research and development." However, as analyses have shown, the "research and development potential qualitatively and quantitatively is not sufficient to achieve or maintain a scientific-technical top level in production and thus a competitive position of the product on the world market."[17] The Academy journal "Spectrum" noted that in addition the previous scientific forecasts generally turned out to be wrong even after a short time. Accordingly, the current research practice in the GDR is supposedly suffering from the fact that the performance criteria and the task definitions are directed too much in terms of what is currently possible and not sufficiently oriented in terms of what is socially necessary. To continue this line of thought, a lack of science and technology compared to the international status is thus already "preprogrammed".[18] It was Professor von Ardenne who now clearly articulated his criticism in a new position paper and named the causes for the existing problems. In an interview with the journal "Neuer Tag", he observed that it was the planned economy which in part inhibited innovative processes.[19] The criticism of the manager-in-charge of the research institute "Manfred von Ardenne", Professor Schiller, pointed in the same direction. He reduces the lack of readiness to take risks to the planning system, which in his opinion is too bureaucratic. As he emphasized, in the GDR "there is too much concern with debits and credit", namely according to the method: "what were the design values like, what are the actual values." Such an attitude has as its consequence that he comes out best "who is more skillfull in laying bricks".[20]

Another source finally issued a call to remember traditional research areas, and to unfold all activities here in a targeted manner, so as to be able to achieve top performances in this fashion. At this point, the question arises how far the consciousness of tradition extends in the GDR. Does it begin after the end of the war with the reconstituted GDR, or does it already start earlier? In the latter case, communications technology would undoubtedly suggest itself as a field of action, since at that time, in the Germany that was then undivided, significant research results and their commerical utilization existed in this sector.

5. Communication Technologies in Transformation World-Wide

The Fourth World's Fair "Telecom '83" in Geneva, in November 1983, provided information concerning the developmental trends appearing in the communications area and considered the most recent developmental status in communications technology. This world's fair was organized under the motto "telecommunications for all" during the year 1983, which was proclaimed by the UNO as the World Communications Year.[21] The offering of technologies and devices which were exhibited by the countries that were present could scarcely be comprehended. The spectrum of exhibitors extended from satellite and glass-fiber communications technologies through digital communications, to the terminal unit in its hundreds of variations.[22] As its name implies, the style of this exhibition, which takes place quarterly, implies a presentation of technical top performances, prototype developments, or new products ready for mass production.

Furthermore, this exhibition also provides indications concerning the innovation strategies of the participating companies, their position on the world market, as well as general developmental trends. Not least of all, it was also made clear here that the boundaries between computer technology and communications technology are being bred more and more, and both technologies are beginning to fuse.

New communication technology and so-called "new media" have already for some time also determined the technological landscape in the Federal Republic of Germany. The new technologies were shown at exhibitions. As also here, new communications techniques were reported at meetings with international participation, and the problems associated with them were discussed. At this point, reference should be made, for example, to the International Radio Show in Berlin and the IBM Conference on Video-Screen Text which likewise took place in Berlin.[23] For the German Federal Mail, the switches have already been set in many respects for introducing new technologies and services.[24]

Thus, video-screen text (Btx)[25] belongs among those "new media" which are already utilized in the Federal Republic. At the same time this is the first mass telecommunications service of the Federal Mail after the introduction of the telephone. Six years after the first public presentation, the starting signal for Btx was given on 1 September. Since the middle of September, new Btx subscribers were connected to the Btx network all over the Federal Republic. According to forecasts, the numbers of subscribers is supposed to double when the technology converts to the IBM system in May 1984, a system which forms the basis of Btx. On the basis of the existing developmental situations, there is no doubt about the introduction of Btx, but sceptics express the fear that a series of problems are inherent in the new service.[26] Btx is a service of the German Federal Mail, which uses elements of telephone, television, and data processing technology. These are:

- the TV unit
- the telephone
- the computer and
- the modem.[27]

Btx was introduced in several countries in approximately the same time frame and with a mutually compatible form, but with different names. In England, under the name PRESTEL, in the USA under the name VIDEOTEXT, in France under the name TELETEL, and in Denmark under the name TELEDATA. Internationally, the nomenclature "interactive video text" is also customary as a synonym.

With a view to the deployment of digital systems for public telecommunications agencies and glass-fiber applications, it can be said that, in these sectors too, the starting signal for a new development stage has already been given to the German Federal Mail.[28] Furthermore, the German Federal Mail intends to supplement the existing cable and video networks by a telecommunications satellite system in the Federal Republic of Germany including Berlin (West).[29] Besides the above-mentioned telecommunications technologies, the following technologies and services also have primary significance: videotext,[30] telefax,[31] and teletex[32]. Beyond doubt, all these communication techniques and the services connected with them will form the future foundation for implementing new forms of text communications systems and will thus pave the way step-by-step for the "electronic office".[33]

6. New Communications Technologies in the GDR and their Developmental Status

The GDR has not embraced the introduction of new communication technologies and services in the scope as has up to now been the case in the Federal Republic of Germany. Likewise, no major power projects have been announced. Nevertheless, it can be said that there has been no lack of activity in the area of telecommunications. Finally, the internationally prescribed developmental lines are known and the necessity for greater efficiency makes it necessary to explicate the new questions and problems. As also in other industrial countries, the increasing integration of computer technology, telecommunications, office technology, and communications technology to form new and more powerful systems was also recognized in the GDR. The opportunities resulting from this have been emphasized. In a summary evaluation of telecommunication forms already deployed in the West, it is observed that these "partly overlap in their objectives and various communications contents of one form could also be realized by another." Consequently, it is further said, an evaluation would have to be "extremely critical in view of the economic efficiency and social necessity of objectives in the transmission of information. An overall social need does not exist to a sufficient extent for every proposal, but can be urged."[34]

The following discussion will now concern the individual developmental situations that have up to now been implemented in the GDR, the expected plans, and possible new problems in the area of telecommunications.[35]

6.1 Digitalization as a Characteristic of the Further Development of Communication Electronics

As an expression of the digitalization in communications technology, which is delineating itself in the GDR, new products were presented in the spring at the occasion of the Leipzig Spring Fair 1983.[36] Thus, the VEB combine Communications Technology Leipzig showed the "application complex RFT Land-telefonie", whose centerpiece was a microcomputer-controlled digital relay center[37] (designation: OZ 100 D).

The VEB Robotron Electronics Radeberg (production enterprise of the VEB Combine Robotron Dresden), in conjunction with the VEB combine Communication Electronics Leipzig, likewise presented a digital radio-link system with the designation PCM 10-400/800 as a new development. Its purpose is to implement wireless feeders between the transmission equipment and base function equipment of radio-telephone systems. According to the information given, this system permits the transmission of digital information with a bit rate of 704 kbits/s.[38]

In connection with new digital telegraphy equipment, the VEB combine Communication Electronics Leipzig furthermore demonstrated a new form of data transmission in the system of RFT Land-telefonie. The transmission system PCM 30/120 with a light-conductor track is the centerpiece of the digital telegraphy equipment.[39] Finally, the VEB Robotron Electronics Radeberg exhibited another novelty, the digital radio link equipment PCM 120-200.

According to the manufacturer's information, this equipment can transmit a total of 8448 kbit/s (corresponding to 120 telephone channels).

When these innovations will be practically installed and available in the GDR itself could not be gathered from the individual press releases and exhibition information.

6.2 Transmission of Communication by Means of Glass-Fiber Technology

The Institute for Communications Technology (INT) in East Berlin is primarily concerned, in the GDR, with the development of the optical transmission of communications. It is the research center of the VEB Combine Communications Electronics Leipzig. In the INT, research and development in the area of light-conductor communications was begun in 1972.[40] Its various activities finally led to the development of an 8 Mbit/s light-conductor track, in adaptation to internationally delineated developmental lines. The work necessary for this was performed in close cooperation with the combine VEB Cable Works Überspree "Wilhelm Pieck", from which also comes the seven-strand light-conductor cable. The light-conductor cable was laid, by the Institute for Postal and Telecommunication matters of the German Post Office of the GDR, from the center of East Berlin into the city periphery to Berlin-Oberschöneweide. The regional direction of the German Post Office of the GDR also participated in this work.[41] It was said further "that the entire system was first "started up in honor of the 30th anniversery of the founding of the GDR and was tested until the middle of 1980."[42]

On 31 March 1981, the light-conductor communications system was then finally officially opened for use by the then still officiating Minister for Electrical Engineering and Electronics, Mr. Steger, the Chairman of the Ministerial Council, and the Minister for Postal Telecommunication Matters of the GDR, Mr. Schulze.[43] The cable line is about 16 km long overall, and consists of a 13 mm thick glass-fiber cable, the associated terminal devices in the telephone offices, and the required signal amplifiers. All together, 120 conversations can be transmitted simultaneously over one line by means of this communications system.[44]

This equipment, which has been presented in East Berlin and which has been officially handed over for actual use, does not appear to be the only one in the GDR, however. As was emphasized in an exhibition information prospectus of the VEB combine Communications Electronics Leipzig at the Leipzig Spring Fair 1983, concerning the transmission system family PCM 30/120, the German Post Office of the GDR "started up the second light-conductor system" when it laid the light-conductor cable in East Berlin.[45]

On the occasion of the Leipzig Spring Fair 1980, and even before the dedication of the East Berlin cable line, a light-conductor communication system was demonstrated as a new possibility for the transmission and communication at the exhibition booth of the VEB Combine Communications Electronics Leipzig.[46] As was reported in detail in this connection, the light-conductor tract is intended to transmit the secondary sequence of 8448 mbit/s. The seven-strand light-conductor cable is the most important part of the system.

The system presented works "in one direction, where all transmission, reception, and intermediate amplification equipment is housed in a local relay center."[47] The technical parameters of this fair exhibit indicate that a similar system concept is involved as in the East Berlin cable line.

Likewise in Leipzig, at the state fairs of 1980 and 1981, the VEB Combine Communications Electronics already exhibited digital transmission systems in which light conductors were contained for the transmission of communications.[48] One can start from the idea that the system PCM 120 and PCM 30 were presented in a proved form at the Spring Fair 1983. Especially on the basis of work at the Institute for Communications Technology, it is to be expected that more glass fiber applications will also be implemented in the future. Another glass fiber cable line will certainly be laid in the GDR in the near future: Within the framework of an agreement with the GDR concerning postal and telecommunication traffic, the GDR approved in principle the erection of a glass fiber cable between the federal area and Berlin (West) through the region of the GDR.

6.3 Cable Distribution Networks for Radio and Television

The installation of a first cable radio and television central began in the GDR at the beginning of the 80's. As Mr. Schmitt observed in this connection, trial operation of a first system of this type was begun in March 1980, in connection with the redesign of the Helpterberg transmitter in Neubrandenburg.[49] It was installed in a densely populated residential area in the center of Neubrandenburg and in a reconstruction area. Its objective was "to supply more than 20,000 of the nearly 80,000 Neubrandenburgers, who existed in 1980, through a cable distribution network, with GDR radio and television programs, and thus to balance out, among other things, the regional supply shortage, especially with the second program of GDR television".[50] The households could be connected, it was further said, without additional investment, since already 86 percent of all residences in Neubrandenburg were already connected to community antenna systems and large-scale community antennas.[51] It can be assumed that the sole manufacturer, the VEB Electronic Devices Burgstädt (production enterprise of the VEB Combine Radio and Domestic Engineering Stollberg) installed a terminal station in Neubrandenburg for large-scale community- and cable-television systems. Such a terminal station with the type designation KS 1200 is part of a cable television system which consists of several functional levels. It permits the transmission of 15 television and 24 USW (stereo) programs.[52]

No further literature references from the GDR concerning other projects of this type are known. However, as could be discovered, another cable distribution network was supposedly started up in the Mülhausen area, the Erfurt district. It is supposed to make possible the reception of several television programs, among others also those from the Federal Republic, with relatively good quality. One can start from the idea that the cabling activities are limited to the examples cited. According to the most recent reports, a responsible GDR agency has begun to guarantee the gapless possible reception of West German television by laying cables in various cities. It was said that the argument made for this was that West German television should no longer be feared. In addition, the GDR citizens were to be given the opportunity to make their own first-hand picture about certain situations, such

as e.g. unemployment, in the Federal Republic.[53] These trends would correspond to directives which Mr. Sydow already gave within the framework of his talk at Munich University in July 1980, namely that all "programs that can be readily received locally should be supplied".[54] Accordingly, also all programs from the Federal Republic of Germany.

Although the plans anticipate more cabling in other residential areas by 1990,[55] Mr. Schmidt observed in this connection that the objectives in the GDR would be limited only to residences in reconstructed areas, on account of the high investment costs.[56]

6.4 Satellite Radio and Television

The allocation plan for the orbital positions and broadcasting frequencies of radio and television programs broadcast through satellites became effective on 1 January 1979. Among other things, frequencies 21, 25, 29, 33, and 37 were allocated to the future GDR satellite, as well as a common orbital position with the line from Poland, the CSSR, Hungary, Rumania, and Bulgaria (one degree western latitiude).[57] In a paper concerning the development of television in the GDR, published in 1982, various interesting facts have indeed been collected. However, the paper contained no reference to an intended television and radio reception via satellite.[58] In other relevant publications, there were no references to impending GDR activities in this connection. According to unofficial reports, however, a system for the reception of various television and radio programs, broadcast by satellite, are being planned in North Berlin. According to reports, the system is supposed to be finished by the beginning of the impending summer Olympiad.

As Mr. Schmidt observed on the basis of GDR plans[59], initial considerations concerning satellite television and radio start from the following utilization concept for the five existing GDR channels:

- Channels 1 and 2 should transmit the two already existing television programs,
- channel 3 is supposed to be used to broadcast all USW radio programs that have been previously transmitted from the ground,
- emergency services as well as educational and informational transmissions for specific target groups are to be broadcast over channel 4 and
- channel 5 is to be kept available for a continuous international program.

Surely, the plans, which at first extend until 1985, do not anticipate satellite television and radio programs for individual reception. Rather, the transmissions will first be retransmitted through already existing cable radio stations, large-scale community antennas, and community antennas.[60]

6.5 The DELTA Computer Center - Example of Computer-Supported Telecommunications

The development, structure, and utilization of public radio networks, including data transmission in computer centers, is being considered in the GDR for some time as an urgent task. It was emphasized in this connection, among other things, that a computer association would be able "to overcome the disadvantage of isolated operation of computer systems".[61] The primary objective should be, "to make available to the users the totality of the software and hardware resources integrated within the computer network".[62]

Discussions with this research complex began in 1973, although initially these discussions had a very theoretical orientation. They were especially favored by the third-generation computers which now were also available in the GDR. Since this time, research and development has been concentrated in the Center for Computer Technology at the Academy of Sciences of the GDR in East Berlin (ZRT) and the Section for Information Processing at the TU Dresden.[63] During the 70's, especially the experience with the implementation of computer networks that was gained by American computer manufacturers and institutions of higher education as well as experience gained in Japan pointed in the direction for the first theoretical and practical operation. In 1977, initial information was published by the Center for Computer Technology of the AdW (Academy of Sciences) concerning the objectives, design principles, and the model of a computer network.[64] The total concept of a computer network with the designation "DELTA" was then finally presented in 1979 by the manager of the Center for Computer Technology, Prof. Meier, in an article in the journal "Rechnertechnik/Datenverarbeitung" (Computer Technology/Data Processing).[65] As Meier emphasizes in another publication, the DELTA computer center "was worked out with an eye to national needs and international trends...as a general concept of a non-localized computer system."[66] Starting from the experience gained, and based on this model, a "first use variant was then implemented, which has been working since the beginning of 1981 in an experimentally productive operation."[67] Further publications concerning the present status of the research work finally followed in the middle of 1983, again in the journal "Rechnertechnik/datenverarbeitung". [68]

The work of Meier's research group at the Academy of Sciences pursued the objective of step-by-step implementation of an extensive computer-supported communications association through an association of resources, data, availability, and function. The computer network model DELTA here serves to gather experience. The work associated therewith is to be understood as a necessary presupposition for the planned introduction of new communications capabilities and for the construction of public data networks.

The DELTA computer network, in its present expansion stage, comprises the following computer hardware: computers of the type BESM6 (USSR) and ESER (Uniform Electronic Data Processing System) computers (EC 1055 from the GDR/Robotron Dresden as well as EC 1022 from the USSR), various peripheral units, as well as units for remote data processing (modems [69] and multiplexers[70]). The concept of the computer network "is based on a decentralized control of hierarchically ordered communication services."[71] It

comprises the following subsystems:[72]

- the communication system KOMET based on packet transmission for the communication function[73]
- operating computer systems (ARS) for the necessary processing and storage functions and
- terminal systems for implementing the access functions.

By furnishing large-computer capacities for institutes and facilities beyond the academy of sciences, it becomes possible to use an additional series of computer network services. The following services are furnished:

- transmission of jobs to a geographically removed computer system by means of "remote job execution",
- the possibility of interchanging data files[74] by means of file transmission (file copy service) and
- the utilization of computer supported telecommunication services.

Especially with a view to telecommunications, it is pointed out that interactive telecommunication between terminals, the operational computer services of KOMET, and memory-oriented forms of telecommunications (mailbox services[75]) are possible.[76]

6.6 Teletex Reception

About two years after the introduction of Teletex service in the German Federal Post Office in the Federal Republic of Germany, a first system for receiving Teletex was developed in 1983 in the GDR at Karl-Marx-Stadt Technical College[77]. The system consists of the following components:

- the microcomputer system Robotron K 1520 (8-bit processor U 880 D, n-MOS technology, from the VEB Combine Microelectronics Erfurt),
- a telex unit (suitably an electronic telex from the device family F 1000 from the VEB Combine Communications Electronics),
- an electronic typewriter of the type Robotron S 6001 (with 8-bit microprocessor U 880 D and 4 kbyte memory) and
- a video screen (Robotron production).

It is emphasized that the system can implement

- reception, processing, and output of Teletex
- the conversion of Teletex into telex text and
- the construction of an internal office network.

On the basis of these capabilities, it is held that the deployment of Teletex will achieve a reduction of administrative effort especially in offices with a large information flow.[78] The case at hand certainly involves only an initial result of advanced research in this area. Consequently, it is to be assumed that, at this time, mass production of Teletex systems of this kind cannot yet be expected in the GDR.

6.7 Video-Screen Text (Btx)

As Schmidt reported, in 1982 there as yet was no decision concerning the introduction of Btx in the GDR.[79] Even in 1983, there were no directives concerning an impending introduction of this communication service. However, it is certain that the French Btx systems TELETEL and ANTIOPE were favored. It was also known that the plans provided for using Btx mainly in scientific institutions, for example, at the Academy of Sciences of the GDR, at universities and colleges, for communication purposes. Only in second place, is it supposed to be used for services, for example, weather predication, theatre schedules, etc. Purchase and sales possibilities as well as advertising by means of Btx are not supposed to be considered here at all.[80]

6.8 Videotext

The telecommunications form of Videotext likewise has not yet been introduced in the GDR. Up to now, publications are concerned mainly with the presentation of the functional principles of Videotext.[81] However, one must start from the idea that, here too, the appropriate institutes, for example the VEB Center on Scientific Knowledge in Dresden, are carrying on research and development. It is less the research and development activities previously performed but rather the activities in Hungary in this sector since the beginning of the 80's that are decisive for the introduction of Videotext in the GDR. When Videotext will be introduced in the GDR and also in other CEMA countries will depend on the experience gained in Hungary. The introduction of Videotext can be expected about the middle of the 80's.[82]

The sole Hungarian manufacturer of computer products, Videoton, furthermore since about 1981/1982 has been producing a portion of the television units required for Videotext reception, including the decoders which are also exported into the GDR. Since 1981/1982, such television units have been produced in the GDR: At the Leipzig Fall Fair 1981, the VEB Combine Stassfurt presented its Colormat 4506/4507, a first unit by means of which Videotext reception is also possible.[83]

7. Forms of Telecommunication in Individual CEMA Countries and their Influence on Developments in the GDR

Already for many years, EDP development within the CEMA has been characterized by broad cooperation between research, development, production, and sales. An expression of this cooperation is the uniform system of electronic computer technology ESER, as well as the system of minicomputers SKR. The advantages of the resulting work division have been frequently noted in the technical press of the GDR. In the area of microelectronics, too, especially since the beginning of the 80's, close cooperation within the CEMA has become customary. For the GDR, the agreements made with the USSR are here especially important. These agreements specify, for example, that, "the components produced by the VEB Combine Microelectronics will be supplemented in the GDR by about an equally large assortment from the USSR."[84] The total demand of the GDR will be covered 40 percent from its own production and 40 percent from deliveries from the USSR. The remaining 20 percent is procured from other CEMA countries.[85] The case of telecommunications, on

the other hand, is somewhat different. Previous development situations in the GDR are making clear that at least some technologies and services were implemented independent of developments and plans in other CEMA countries. Examples of this are, for example, the light-conductor lines and cable distribution networks installed in the GDR. As Schmidt assumes, within the CEMA, on the other hand, only such media developments are coordinated, "for which technical innovations and financial means extending beyond the national context are necessary" (example: satellite television).[86]

The following discussion should provide a brief survey of media concepts already implemented by other CEMA countries, which may possibly be of significance to further GDR development.

7.1 The Development of Videotext in Hungary

About the beginning of the 80's, the first visible activities started in Hungary, which aimed towards the development and introduction of Videotext (system teletex[87]). The first trial transmissions were already made in 1981. In parallel to this, Videoton, known as manufacturer of computer products, also offered the first television units designed for Videotext reception. After the trial transmissions were completed successfully, the Hungarian television Magyar Televizo, in the first half year of 1982, began study trial operation for a few hundred subscribers.[88] The plans provide for Videotext to become a definitive installation between 1983 and 1984. Decisive for this, however, will be the experience that has been gained with the new service. Whether the Hungarian model will also be introduced in other CEMA countries beginning in 1984/1985 will also depend on this experience. It is not known whether the CEMA institutions responsible for this have in the meantime decided in favor of the Hungarian Teletex system. But in the meantime it is known that Bulgaria, with its Bultext system, has developed its own national pilot project. In the USSR, too, Videotext programs (system: Antiope) were already broadcast during the Olympic games in the summer of 1980.

7.2 The Experimental System Bultext - The Beginning of Videotext Development in Bulgaria

There are reports from Bulgaria that, in the area of the Ministry for Postal and Telecommunications, an "experimental system" called "Bultext" has been worked out to "test the quality of additional information in the television signal".[89] Like the Hungarian Videotext model, the Bulgarian system also represents an adaptation of the British Teletex system.

The hardware foundation of the Bulgarian Videotext system includes an ESER computer of type EC 1010 (manufacturer: Videoton/Hungary development series 1 of ESER), which is installed in the computer center of the Ministry for Postal Matters and Telecommunications in Sofia, as well as a coding device for information output, which is installed in the Sofia television tower 4 km away. The two are connected by cable lines. Bultext contains "a large number of text pages and graphics"[90]. Among other things, these provide information concerning "schedules at theatres and movies, departure times of trains and buses, current sports results, and precise information regarding weather in the high mountains or at the Black Sea."[91]

The reception of Videotext is possible with a commercial television unit to which, however, it is said, a supplementary unit must be connected. The first trial transmissions appear to have been positive. They demonstrate the "good quality of reception of the supplementary information by the Bultext system".[92]

It can scarcely be expected that the Bultext system will be important for the GDR since, as was already pointed out elsewhere, introduction of the Hungarian system is being discussed in the GDR.

The activities in the telecommunications sector in Bulgaria, however, are not limited solely to the testing and introduction of Videotext. As is apparent from a report from the Bulgarian communications agency bta, a chain of relay stations is supposed to be erected across the country. Likewise, it is planned to lay a coaxial cable line. By means of these steps, which are supposed to become parts of the "Medarabtel" communication network, Bulgaria wants to develop into a "communications transit country" and wants to guarantee a connection between Europe and the Near East.[94]

7.3 The Development of Telecommunications in the USSR

Initial development accomplishments in the area of telecommunications in the USSR were first reported in conjunction with the transmission of the Olympic summer games in Moscow in 1980. With the erection of new sport installations, the expansion of already existing radio link and cable networks as well as the implementation of new communication connections were also regarded as necessary, so as to secure the most comprehensive and smooth reporting.

The various forms of telecommunication "were planned and implemented in such a fashion that after completion of the Olympic games, they would serve to satisfy the continually growing requirements of the national economy and of all Soviet people, the speeded-up implementation of long term plans to create a uniform automated communication system, as the decisions of our party congresses anticipate."[95]

On the basis of these and previous activities, the following communications systems and telecommunication forms and services were created:[96]

- radio link and cable lines
- the satellite system Intersputnik
- light conductor lines and
- Videotext trial programs (system concept taken over: the French Videotext system Antiope).

Possibly the GDR will profit from the information and experience gained in the Soviet Union. Especially if communication concepts and teleservices which pass beyond national borders are provided on the basis of two-sided cooperative agreements and planned coordination.

8. Possible New Problems connected with the Introduction of New Forms of Telecommunications

As has already been pointed out elsewhere, an "overall social need" will not exist in the GDR for every form of telecommunications.[97] Consequently, it is to be expected that here, beginning in the middle of the 80's, fewer services and techniques will be available here than in the Federal Republic. With the specification and introduction of communication transmission systems and teleservices which currently are still in the trial stage, the GDR will certainly experience additional problems. The combine Robotron Dresden, by the middle of 1983, did indeed deliver the mechanical parts for the CBM 80-28 printer of the personal-computer manufacturer Commodore, which was built in the Federal Republic, and it also produced a similar printer that was intended for export to the West. On the other hand, the demand for computer products in its own country itself cannot be covered. As the manager of the scientific area "Technology and Communications" at the Dresden College of Traffic, Professor Kleinau, declared, the GDR, for economic reasons, cannot expand its telecommunication network in the intended manner.[98] The point now is not only to push ahead microelectronics, to implement the most economical deployment of industrial robots, and to furnish adequate EDP capacities which cover "overall social needs", but also to implement further efficiency solutions, especially in the area of communications. The implementation of efficiency solutions requires, for example:

- furnishing more universal computers and also computer systems from the product program of "decentralized data technology" of the combine Robotron Dresden,
- furnishing of television units which make possible individual reception of Videotext, for example through the combine Radio and Television Strassfurt, or through imports from Hungary;
- furnishing systems and devices for message transmission through the combine Communications Electronics Leipzig;
- extensive preparations on the part of the German Post Office of the GDR with a view to furnishing technical facilities and services and
- possible software solutions, which are necessary in conjunction with the introduction of one or another form of telecommunications.

On the basis of the current developmental status of telecommunications, one can start from the idea that in the GDR one should not at first think about using any "new media", for example Videotext or Btx, for individual entertainment. On the other hand, the implementation of such forms of telecommunication which promise "overall social utility" have an essential significance. Under this aspect, therefore, the expansion and the construction of cable distribution networks have special priority. One would also dedicate oneself to the further development of the DELTA computer network. On the basis of information gained in this connection, one will implement further application forms of computer networks, especially for the improved management and planning of central government organs. Telecommunications for individual consumption, as already noted elsewhere, will at first be limited to a new form of continuing education. This will happen at a specified time, beginning in the middle of the 80's.

9. Means for Implementing Scientific-Technical Progress

Both the "law concerning the economic plan 1984" and also the speech by Willi Stophs at the Eight Congress of the Parliament of the GDR, repeatedly emphasized the implementation of scientific technical progress to secure the growth of the GDR economy as a most important task.[99] The implementation of scientific-technical progress means, as has already been pointed out in the introduction, not only increased use of microelectronics, but also greater efficiency by means of new forms of telecommunications. Now, to increase perceptibly the economic efficiency of science and technology, and to solve previous problems in the introduction of new technology, a series of measures was taken in the very recent past, and new proposals were submitted. The proposals by Hartmann and Richter can be considered as certainly pointing the direction here. Among their publications, they pointed out to the combines and enterprises a large number of "paths towards top performance".[100] Their proposals extend from computer-supported labor and schedule planning of research tasks up to performance comparisons between the research centers and the combines. It is said that some of these proposals have already been implemented. From the implementation of such proposals and from a series of government-promoted measures, one hopes for the efficiency breakthrough that has already been required for some time. A few examples will show what kind of measures are involved here in particular.

(1) Specifications of new directives for industrial research in a "specifications-manual ordinance" that already became effective in 1982.

To promote scientific-technical progress, new directives for industrial research were issued[102] in a "ordinance concerning the specification manual for tasks of research and development - specifications manual ordinance of 17 December 1981". This ordinance became effective in January 1982. Here, for example, government and economic agencies, combines and enterprises, scientific institutes, the Academy of Sciences in the GDR, as well as universities and colleges are obliged to use expected international standards as a basis for the development of new products to a far greater extent than previously. These international developments should be up to date at the time that the new products and technologies are ripe for production and marketing. This provided a legal regulation for the requirement, which the political management of the GDR has already imposed for some time, to orient oneself in accord with the international scientific-technical level when implementing "top performances". To secure also the achievement of innovations, the specifications manuals prescribed in connection with all research and development tasks, in which economic and technical objectives are listed, will be subjected to an intensive examination by economic agencies. Only if these agencies have proved the specified objectives, should the new scientific-technical project be begun.

(2) Increased follow-up use and multiple use of already existing scientific-technical results

Economically perceptible effects should also be achieved by increased multiple use and follow-up use of already existing and therefore available scientific-technical results, novelties, and orienting MMM achievements.[102] Proven methods of work and experience of "progressive" enterprises and combines should be normative in this connection, for example, the VEB Combine Karl Zeiss Jena. The instrument of follow-up use should achieve not only numerous economic effects but should also reduce existing differences in level between enterprises and combines. To achieve the goals pursued with follow-up use and multiple use, the Ministry for Electrical Engineering and Electronics has created management instruments, for example, "by means of which general directors of the combines were given orientation guidelines so as to influence qualitatively and quantitatively the movements in innovation and follow-up use. Among these belong, as was explained further at this point, the rooting of developmental directions and economic objectives in the planned national economy and the joint orientation of the Minister for Electrical Engineering/Electronics and the Chairman of the Central Board of the IG-Metall to develop innovations for follow-up use by 1985."[103]

(3) Increased attention to management tasks on the part of the general directors of the combines

A normally obvious task of the general directors of the combines was recently simply raised to an obligatory duty: The "follow-up, future-oriented analysis of customer and user needs and of market development."[104] In another source, this is explained as follows: "It is all the more important to meet market requirements as exactly as possible with the definition of scientific-technical tasks and thereby to exclude all randomness. In each combine, it is important to qualify research on demand and on the market, and to work out, in closest contact with customers and users, the necessary informational bases for specialized and product development that is rich in ideas."[105]

(4) Setting up "inventor councils" in the combines

As another measure to solve problems connected with the implementation of scientific-technical progress, especially during the research and development phase in the combines, one believes that, among other things, "inventor councils" should be set up in the combines. Such "inventor councils" should contribute to the implementation of innovations on the basis of a forward looking and analytical activity. The combine for Air Engineering and Cryogenics was named as an example of such activities.[106]

(5) Implementation of economically meaningful innovations by "inventor schools"

As can be learned from various publications, in all regions of the GDR, the Chamber of Technology (KdT) has established so-called "inventor schools"[107]. The goal of these "inventor schools" should be to increase significantly the

proportion of young inventors under 30 years old. The participants in training courses "are trained for one week according to a uniform plan of instruction, then work for a longer time intensively on their research problems, and finally are brought together for another week."[108] It was pointed out, that up to now, more than 700 researchers and engineers have visited the KdT inventor schools. As was said in supplementary fashion, "patents with a utility of over 4 million marks" were applied for within one year.[109] Accordingly, therefore, the "inventor training" was evaluated positively by the KdT.[110] However, the President of the Office for Inventions and Patents, Professor Hemmerling, recently warned against placing too great expectations on the "inventor schools". As he emphasized, "it would be an illusion to believe that inventors only need to be trained, and that things take care of themselves." According to Professor Hemmerling's views, "inventor schools" are to be understood merely as a teaching aid, no more, no less.[111]

(6) Promoting inventive creativity by means of a new patent law

According to the statements of Professor Hemmerling, progress in inventive activity were indeed recorded; nevertheless, a new patent law aimed, "to complete still further the existing favorable conditions for inventive creativity" would promote demanding inventions even more.[112]

(7) Elimination of disproportions by a new research strategy

Finally, existing disproportions are also supposed to be eliminated with a new research strategy, involving the implementation of scientific-technical progress. To what extent this has already been fully considered in the "strategic documents concerning the long-term development of scientific and mathematical basic research as well as basic research in selected technical directions" and in the "conception for the development of natural science and engineering in the time period up to 1990"[113] is not known. In September, 1983, a two-day Academy colloquium took place, which discussed in particular the possibility of increasing the contribution of basic research to increase the output of the economy.[114] Furthermore, improved education and further training would also be desirable at the colleges and technical schools.

However, earlier measures had to remain largely ineffective, because previously practiced forms of management and planning were not supposed to be questioned. Nevertheless, the self-critical observations of scientists and economists from the GDR touch previously treasured principles of the management and planning system to a not inconsiderable extent. References to existing discrepancies between the economic system and scientific-technical progress, the further problems that are developing from this precisely due to stormy development in technology, and possible conclusions therefrom, could certainly be expected.

It is necessary to adapt more successfully than before to the manifold transformations induced primarily by scientific-technical development. For this purpose, the necessity of changes in the control of the economy was emphasized as unavoidable in the August issue of the SED Journal "Einheit"

(Unity) by the social scientist Reinhold. According to Reinhold's idea, the already achieved standard of living of workers cannot be secured nor can it be increased step-by-step "in the same fashion today and tomorrow as it was 10 or 20 years ago.[115] Precisely with a view to technological development during recent years, "old forms of management and planning for the national economy are beginning to contradict the new requirements of intensely expanded production and consequently must be further developed and completed step-by-step."[116]

This puts into prospect changes in management and planning which do not imply a change of the existing central planning system but changes "within the existing system of management and planning". It is a new attempt to find a path, within the framework of the existing system, that is optimized with respect to new circumstances, a new possibility to decentralize necessary tasks where appropriate, and in this fashion to secure the stabilization of rulership.

Abbildung 2: Telekommunikationsdienste im Rechnernetz DELTA

Kommunikationsform 1	RN-Subsystem 4	5 Dienst	Kommunikationspartner 11	12 Anwendungen
interaktiv 2	TLS	TL-Kommunikation 6	TL - TL TL - TIP	- Nutzer-Kommunikation 13 - TLS-Betriebstechnologie 14
	KOMET	Telegramm 7	KR - KR	- Wartungskommunikation 15 - Havarie-Kommunikation 16
	ARS	Operator-Kommunikation 8	ESER - ESER BESM6 - BESM6 ESER - BESM6	- Produktionsabstimmung 17
speicherorientiert 3	TLS	T-Mailbox 9	TIP	- Nutzer-Kommunikation 18 - Software-Verteilung 19
	ARS	A-Mailbox 10	ESER - ESER BESM6 - BESM6 ESER - BESM6	- zeitgesteuerte Operator-Anweisung 20 - Standard-Mailbox "OPERATOR" 21 - "HELP-DIENST" 22 - Entwickler-Kommunikation 23

Quelle: Hermann Walter Meier: "Rechnernetz DELTA ...", a.a.O., S. 8

Abkürzungen:

ARS	= Arbeitsrechnersysteme	RN	= Rechnernetz
ESER	= Einheitliches System der elektronischen Rechentechnik	TIP	= Terminal-Interfuce-Prozessor
KR	= Kommunikationsrechner	TL	= Terminal
		TLS	= Terminalsysteme

Figure 2: Telecommunications services in the DELTA computer network

1	form of communication
2	interactive
3	memory-oriented
4	computer network subsystem
5	service
6	telecommunication
7	telegram
8	operator communication
9	T-mailbox
10	A-mailbox
11	communications partner
12	applications
13	user communication
14	TLS operating technology
15	maintenance communication
16	emergency communication
17	coordination of production
18	user communication
19	software distribution
20	time-controlled operator directive
21	standard mailbox "operator"
22	help service
23	developer communication

Source: Hermann Walter Meier: "Computer network DELTA..." loc. cit. p. 8.

Abbreviations:

ARS	=	operating computer systems
ESER	=	uniform electronic data processing system
KR	=	communications computer
RN	=	computer network
TIP	=	terminal interface processor
TL	=	terminal
TLS	=	terminal systems

Figure 4: Videotext systems in the CEMA

Land 1	System-Bezeichnung 6	Übernommenes System-Konzept 7	Entwicklungsstand 11
Bulgarien 2	Bultext	8 Teletext/Großbritannien	Probebetrieb seit 12 1983
DDR 3	-	-	Einführung des ungarischen Videotext-Systems geplant 13
UdSSR 4	Videotext (?)	9 Antiope/Frankreich	Probebetrieb etwa 1980 aufgenommen 14
Ungarn 5	Videotext	10 Teletext/Großbritannien	Probebetrieb seit 1980 15

1 country
2 Bulgaria
3 GDR
4 USSR
5 Hungary
6 system designation
7 system concept taken over
8 Teletext/Great Britain
9 Antiope/France
10 Teletext/Great Britain
11 development status
12 trial operation since 1983
13 it is planned to introduce the Hungarian videotext system
14 trial operation started about 1980
15 trial operation since 1980.

FOOTNOTES

1. By the term "media" is generally understood a means to transmit and represent messages. However, for some time the term "new media" has been taken over into the language. It designates all those methods and means of electronic communication and electronic transmission of messages which have been recently developed and have been practically applied. In this connection, also compare the explanations by Peter Lanzendorf: New Tele-Media from A to Z, Berlin-Offenbach 1983, p. 3 and 4.

2. In this connection, compare the report of the Central Committee of the Socialist Unity Party of Germany to the 10th Party Congress of the SED. Author of the report, Erich Honecker. 10th Party Congress of the SED, 11-16 April 1981, Berlin (East), 1981, p. 48 ff. As a supplement also: Directive of the 10th Party Congress of the SED to the Five-Year Plan for the Development of the National Economy of the GDR during the Years 1981 through 1986. 10th Party Congress of the SED, 11-16 April 1981, Berlin (East), 1981, p. 10 ff.

3. In this connection also compare Klaus Krakat: The path to the third generation. The development of EDP in the GDR until the beginning of the 70's. FS Analyses No. 7/1976, p. 17 ff.

4. Compare "Law concerning the five-year plan for the development of the national economy of the GDR 1976 - 1980 of 15 December 1976", GBl II 1976, No. 46, p. 519-532.

5. In this connection, also compare the explanations by Klaus Krakat: Implementation of scientific-technical progress using microelectronics as an example. FS Analyses, No. 1/1980, p. 18 ff.

6. As regards new designs and redesigns of the combine within the industrial area of electrical engineering/electronics, compare Klaus Krakat: Organizational practice in the GDR. Examples of economic and management organization. FS Analyses No. 3/1980, here particularly p. 9-57. Concerning the overall process of combine formation within the GDR industries, its background and objectives, compare especially Kurt Erdmann and Manfred Melzer: "The new combine ordinance in the GDR: Opportunities and limits of performance stimuli from uniform combines (First part)" in: Deutschland Archiv (Germany Archive) Cologne, No. 9/1980, p. 929 - 942, as well as Part 2 ibid, No. 10/1980, p. 1046-1062.

7. Helmut Koziolek: "Economic strategy, scientific-technical progress, and the higher efficiency of mathematics and computer technology for the effectiveness of the economy of the GDR", in: Einheit (Unity), Berlin (East), No. 2/1983, p. 169.
In this connection, also compare Wolfgang Lassmann: "Fast reacting and more flexible with optimization calculations" in: Die Wirtschaft (The Economy) Berlin (East), No. 12/1982, p. 13.

8. In this connection, compare the explanations of Klaus Steinitz/Hans Schilar: "Some problems of value formation and implementation in connection with the development and application of microelectronics" in: Wirtschaftswissenschaft (Economics) Berlin (East), No. 10/1983, here particularly p. 1513.

9. In this connection, also compare the explanations of Helmut Leipold: "Property rights, the degree of public character and innovation weakness - teachings from systems comparison", in: Innovationsprobleme in Ost und West, Schriften zum Vergleich von Wirtschaftsordnungen (Innovations Problems in the East and West, Writings to Compare Economic Orders) Issue No. 33, Stuttgart-New York, 1983, p. 51-64.

10. Thus Harry Nick in: "Problems in the completion of the social management of scientific-technical progress", in: Wirtschaftswissenschaft (Economics) Berlin (East), No. 4/1078, p. 407.

11. Günter Mittag: "Continued success along the course of the Ninth Party Congress", in: Newer Weg (New Path) No. 15/1977, p. 676 and 677.

12. Harry Nick: "Problems in the completion of the social management of scientific-technical progress", loc. cit., p. 407.

13. Ibid.

14. Günter Mittag: "Socialist efficiency - the path to strengthen our economy" in: Einheit (Unity) Berlin (East), No. 11/1979, p. 1121.

15. In this connection, compare the explanations by J. Kramer, K. Heyner, A. Kerstan: "Information first hand" in: der neuerer (The Innovator) Berlin (East), No. 12/1981, p. 380-383.

16. Manfred von Ardenne: "The romantics of science" in: Wochenpost (The Weekly Post) No. 3 of 15 Jan 1982.

17. Werner Scheler: "Relationships between basic research and production" in: Einheit (Unity) Berlin (East) No. 8/1983, p. 729.

18. Compare in this connection "Strategies for innovation", Round table discussion in: Spectrum, No. 1/1983, p. 10-13. - As regards innovation behavior of the enterprises and combines, compare particularly the explanations by Günter Lauterbach: Technical progress and innovation. The innovative behavior of enterprises and combines in the GDR. Erlangen 1982.

19. Thus Manfred von Ardenne in: Neuer Tag (New Day) of 21 May 1983. Quoted in: Information Office West Berlin, Tagesdienst No. 79 of 28 May 1983, p. 2.

20. Thus in Radio GDR II. Quoted in the service of the Information Bureau West, Berlin, No. 2 of 5 January 1983. Compare the same also: "Introduction of new action principles into production" in: Einheit (Unity) Berlin (East), No. 8/1983, here especially p. 735 and 736.
As regards the lack of readiness to take risks, compare also Peter Kroh: "Scientific-technical progress in socialism and the role of personality" in: Polytechnical Education and Training, Berlin (East), No. 8-9/1983, p. 285 and 286 as well as Kurt Endler: "Answer to current questions. What role does the readiness to take risks play in our struggle for top performances?" in: Neuer Weg (New Path) Berlin (East), No. 16/1983, p. 633-635.

21. On 19 November 1981, the UNO Plenary Assembly proclaimed the year 1983 as the World Communications Year. As was said in this connection, the importance of telecommunications for economic and social development in individual countries was not acknowledged for the first time. As regards the individual situations in telecommunications, compare, among others, Richard E. Butler: "World Communications Year 1983 - Challenge and Chance" in: Siemens Zeitschrift (Siemens Journal) Berlin-Munich No. 5/1983, p. 14-16, as well as Hans Bauer: "ISDN - the telecommunications network of the future" in: Siemens Zeitschrift (Siemens Journal) Berlin-Münich, No. 6/1983, p. 10-14.

22. As regards the Geneva Telecom '83, compare Helga Biesel: "Geneva exhibition as a forum for large businesses and a facade for utopias, Telecom: The whole world between ISDN and SNA" in: Computerwoche (Computer Week), Münich, No. 45 of 4 November 1983, p. 1 and 2; "Digital switching systems for world-wide use" AT&T with a new identity on the Geneva Paquet" in: Computerwoche (Computer Week) Munich, No. 46 of 11 November 1983, p. 33. Other information regarding Telecom '83 ibid., p. 33, 34, and 35, as well as in Computerwoche (Computer Week) No. 47 of 18 November 1983, p. 22.

23. Compare, in this connection, in particular, " First video screen text congress of IBM in Berlin: The market leader demonstrates Btx competence", in: Computerwoche (Computer Week), Munich, No. 50 of 9 December 1983, p. 1.

24. A good survey of the communications technology including new communication services in the Federal Republic of Germany is given by the following informational document published by the Central Association of the Electrical Engineering Industry e.V. (Technical Association of Telecommunications Technology): Communications Technology in the Federal Republic of Germany, Frankfurt a.M. 1983.

25. Video screen text, abbreviated: Btx, is the German designation for interactive communications services. It was publicly presented for the first time in 1977, by the German Federal Post Office, at the International Radio Exhibition in Berlin.
As regards Btx and its possibilities, compare among others: "Video screen text as 'system changer'" in: Diebold Management Report, Frankfurt a.M., No. 2/1983, p. 1-4.

Eberhard Holler: "Video screen text in the context of telecommunication" in: Diebold Management Report, Frankfurt a. M., No. 6/7 1983, p. 5-9, as well as further papers, ibid. p. 9-13.
Helmut Kalt: "Video screen text easy for everyone" in: Siemens Zeitschrift (Siemens Journal), Berlin-Münich, No. 5/1983, p. 17-20.
Peter Lanzendorf: New tele-media from A to Z. loc. cit. p. 25-58.
Klaus Fellbaum, Rainer Hartlep: "Lexicon of telecommunications, Berlin Offenbach, 1983, p. 35-43, as well as "Video screen text as technical 'menage e trois'" in: Der Tagesspiegel (The Daily Mirror), Berlin, 25 August 1983, p. 14.
The following journals should be named, which deal especially with the medium of video screen text: Video Screen Text, Information for Suppliers and Subscribers, Vogel Verlag KG Würzburg, Vol. 2, 1983; Video Screen Text Magazine for Tele-Readers, Neue Mediengesellschaft Ulm Publishers GmbH, as well as Btx Practice. The technical journal for video screen users, Neue Mediengesellschaft Ulm Publishers GmbH.

26. In this connection compare: "Btx and the 'floppyists'" in: Diebold Management Report, Frankfurt a. M. No. 6/7, 1983, p. 1-5.

27. Modem, abbreviation for: Modulator-demodulator, a device for data transmission on telephone lines.

28. As regards glass fiber technology and message transmission with light compare particularly: telcom report, Berlin-Münich, April 1983, supplementary issue; "Digitalization and glass fiber applications in the foreground. Federal Post Office: goodbye to unit technology" in: Computerwoche (Computer Week), Munich, No. 47 of 18 November 1983, p. 22;
"Built of sand. The age of glass fiber technology has begun." in: Diebold Management Report, Frankfurt a. M., No. 5/1982, p. 1-6;
Ewald Braun: "New forms of communications technology - example BIGFON" in: Siemens Zeitschrift (Siemens Journal) Berlin-Munich, No. 6/1982, November/December, p. 9-13, as well as Peter Lanzendorf, loc. cit. p. 84-90.

29. Thus the brief report "Start for 'German telecommunications satellite system'" in telcom report, Berlin-Münich, No. 4/1983, August, p. 248, also in this connection, regarding satellite broadcasting and television, Peter Lanzendorf, loc. cit. p. 58-77 and regarding cable television, ibid. loc. cit. p. 77-84.

30. By means of video text systems, writing and graphics can be transmitted in the vertical writing gaps of the video signal. - In this connection, also compare, among others, Klaus Fellbaum, Reiner Hartlep, loc. cit. p. 253-255.

31. By the term Telefax (German: Telecopying), one understands a standardized service of facsimile transmission which has been introduced as a new service of the Federal Post Office, effective 1 January 1979.

In this connection compare also, among others, Klaus Fellbaum, Rainer Hartlep, loc. cit. p. 224-229.

32. Teletex is a special term for the service of office telefax. The Teletex service in the German Federal post office has already existed since 1981. It is thought of as a substitute for the technically outmoded Telex service. For example, it offers a significantly higher transmission rate, specifically around 2400 bits/second as compared to 50 bits per second.
In this connection compare particularly, among others, Peter Lanzendorf, loc. cit. p. 120-123, Klaus Fellbaum, Rainer Hartlep, loc. cit., p. 232-239, and Hienz-Dieter Grösser, "Teletex - supplement and extension of telex and telecopying" in: Handelsblatt (Commercial Journal) of 22 January 1979.

33. For further explanations on this point compare Ino Lanius, Wolfgang Wilde: "With text communications systems to the electronic office" in: data report, Berlin-Munich, No. 4/1983, p. 24-27.

34. Heinz Bergmann: "New forms of commercial communication" in: radio-fernsehen-elektronic (Radio Television Electronics) Berlin (East) No. 7/1981, p. 464.

35. Wolfgang Schmidt already has also reported on new telecommunication forms and "new media" in the GDR. In this connection compare: "The new media in the GDR. Distribution and perspectives" in: Media Perspectives, Frankfurt a.M., No. 10/1983, p. 668-674.

36. As regards the individual fair exhibitors and their performance parameters, compare, among others, the references in: "Leipzig Spring Fair 1983. New technical solutions through microelectronics in the offer of the RFT communications electronics" in: Communication Electronics, Berlin (East) No. 3/1983, p. 126 and 127;
"Leipzig Spring Fair 1983, Part 2 and Conclusions", here especially the report "Communications devices" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East) No. 7/1983, p. 431 and 432, and also the Fair Preview in the journal messen-steuern-regeln (Measurement Control Regulation) Berlin (East) No. 3/1983, p.174.

37. On this point also compare the fair information of the VEB Combine Communications Electronics Leipzig concerning the fully electronic relay station OZ 100 D at the Leipzig Spring Fair 1983.

38. The bit rate designates the transmission speed. It is specified in bits per second. The effective transmission speed specifies how many bits of information (data) per second are transmitted over a line.

39. On this point also compare the special exhibition information document of the VEB Combine Communications Electronics Leipzig regarding the transmission system family PCM 30/120, at the Leipzig Spring Fair of 1983, and as a supplement to this also the relevant references in Sec. 6.2.

40. Thus Herbert Bose: "Development of optical message transmission in the GDR" in: Nachrichtentechnik-Elektronik, Berlin (East) (Communications Technology-Electronics), No. 9/1981, p. 388.

41. Compare ibid. and also the brief information "Telephone traffic over light-conductor cables" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East), No. 6/1981, p. 339.

42. Herbert Bose, loc. cit. p. 388.

43. Compare "Telephone traffic over light-conductor cables", loc. cit. p. 339.

44. Ibid.

45. Transmission-system family PCM 30/120, Full information prospectus of the VEB Combine Communications Electronics Leipzig, Leipzig Spring Fair 1983. However, at the exhibition booth of this combine, it could not be said where this second cable line was installed.

46. In this connection, compare: "Leipzig Spring Fair 1980. Signs of Progress", here the fair report, "Communication devices" in: radio-fernsehen-elektronik (Radio Television Electronics), Berlin (East), No. 6/1980, p. 360.

47. "Leipzig Spring Fair 1980. Signs of Progress", loc. cit. p. 360.

48. In this connection, compare particularly the press release for the Leipzig Spring Fair, 1980. Branch report on communications technology, pages 3 and 7 as well as "VEB Combine Communications Electronics at the Leipzig Spring Fair 1981" in: Nachrichtentechnik-Elektronik (Communications Technology-Electronics), Berlin (East) No. 6/1981, p. 261-262.

49. In this connection compare the data of Wolfgang Schmidt, loc. cit. p. 670.

50. Wolfgang Schmidt, loc. cit., p. 670.

51. Ibid.

52. Regarding the function and performance parameters of the terminal station, compare Heinz Teichmann: "Terminal station for large community and cable television systems", in: radio-fernsehen-elektronik (Radio Television Electronics), Berlin (East), No. 2/1981, p. 73-77.

53. Compare, in this connection, the report "Bonn: 75 to 80 percent already now see Federal German programs. GDR is cabling for Western television", in: Essener Tageblatt (Essen Daily Journal) of 9 December 1983 - Post-deadline copy.

54. Otto B. Roegelle: "No full cabling in the GDR", in: Rheinischer Merkur (Rhenish Mercury) of 1 August 1980.

55. In this connection, compare Werner Sydow: "The electronic mass media in the GDR - developmental trends and preferred actions" in: Rundfunkjournalistik in Theorie und Praxis (Radio Journalism in Theory and Practice), No. 3/1980, quoted by Wolfgang Schmidt, loc. cit. p. 670 as well as Otto B. Roegele, loc. cit.

56. Wolfgang Schmidt, loc. cit., p. 670.

57. Ibid. p. 671.

58. Compare, in this connection, Ralf Lenk: "The development of television in the GDR" in: radio-fernsehen-elektronik (Radio Television Electronics), Berlin (East), No. 12/1982, p. 751-754, as well as other papers concerning the situation of GDR television, ibid, p. 754-789.

59. Thus Walter Conrad: Electricity at the Viewing Point, Leipzig, 1981, p. 101-102, reproduced by Wolfgang Schmidt, loc. cit., p. 671.

60. Compare Wolfgang Schmidt, loc. cit., p. 671.

61. Hermann Walter Meier: "DELTA computer network. Concept, first use area, and services" in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing)., Berlin (East), No. 6/1983, p. 6.

62. Ibid.

63. Concerning the development of the DELTA computer network, compare, among others, the explanations of Bardo Diehl: "Electronic data processing" in: Institute for Society and Science (IGW) at Erlangen Nuremberg University. Science in the GDR, First Quarterly Report 1980, p. 53-67; Hermann Walter Meier: "Structure and development of computer networks", in: Contributions to Information Processing, Leipzig, 1977, p. 59 ff; Franz Stuchlik: "Architecture of application systems of EDP", in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing) Berlin (East), Supplementary Issue No. 4/1979; Hermann Walter Meier: "The use of the DELTA computer network" in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing) Berlin (East), Supplementary Issue No. 4/1979; likewise: "The DELTA computer network. Concept, first use variants, and services", in: rechentechnik/datenarbeitung (Computer Technology/Data Processing) No. 6/1983, p. 6-8, as well as other papers on the DELTA computer network in the same issue, p. 9-21.

64. In this connection, compare Hermann Walter Meier: "The use of the DELTA computer network" in: rechentechnik/datenarbeitung (Computer Technology/Data Processing) Supplementary issue No. 4/1979.

65. Ibid., p. 19 ff.

66. Herman Walter Meier: "DELTA computer network. Concept, first use, variants and services", loc. cit., p. 6.

67. Ibid.

68. rechentechnik/datenverarbeitung (Computer Technology/Data Processing) No. 6/1983, p. 1-21.

69. A modem (modulator-demodulator) is a data transmission device which converts d.c. signals into a.c. signals and vice versa.

70. A multiplexer is a functional unit which converts data arriving at a large number of communication channels into a smaller of communication channels, and vice versa.

71. Hermann Walter Meier: "Rechnernetz DELTA...", loc. cit., p. 6.

72. For further aspects of the DELTA concept and its implementation, compare ibid., p. 6 and 7.

73. Packet transmission is a method of data transmission in networks where the data being transferred are subdivided into so-called "packets". They reach their destination on routes that may differ depending on the network occupation. The basic idea of such a transmission is to use a public data transmission network as economically as possible.

74. File, English word for "Datei", i.e. a set of data units or data records with identical or compatible data formats.

75. In connection with electronic communication, one understands by this a memory region (for example, of a local switching station), in which a message in voice or text form can be stored and called.

76. On the implementation of communication services, especially mailbox service within the DELTA computer network, compare Ingo Bludau, Wolfgang Blume, Gertraud Hoffman, Franz Janitzek, Bernd Rieger, Jürgen Römer: "Terminal system of the DELTA computer network", in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing) No. 6/1983, here: p. 13 as well as Wilfried Dames, Volker Heymer, Klaus Peter Jerzynek: "Mailbox service in the DELTA computer network" in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing) No. 6/1983, p. 15-19.

77. Compare the brief notice "Teletex reception" in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing) Berlin (EAST) No. 9/1983, p. 3.

78. Ibid.

79. Wolfgang Schmidt, loc. cit. p. 669.

80. In this connection, compare Wolfgang Schmidt, loc. cit. p. 669.

81. Thus, among others, Herbert Wagner: "Systems for supplementary information in the television signal" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East) No. 12/1982, p. 756-761.

82. Compare Wolfgang Schmidt, loc. cit. p. 670.

83. In this connection, compare especially: "Leipzig Fall Fair 1981" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East) No. 12/1981, p. 785.

84. Wilfried Löffler: "Integrated circuits from the USSR" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East) No. 11/1983, p. 690.

85. Ibid.

86. Wolfgang Schmidt, loc. cit. p. 672.

87. Teletext is the British designation for teletext systems.

88. Thus Wolfgang Schmidt, loc. cit., p. 669.

89. Kiril Konov, Zenka Vasileva and Peter Pejev: "Bultext - system for the transmission of supplementary information in the television signal" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East) No. 8/1983, p. 497.

90. Kiril Konov, Zenka Vasileva, and Peter Pejev, loc. cit. p. 499.

91. "Bultext", brief notice in: rechentechnik/datenverarbeitung (Computer Technology/Data Processing), Berlin (East) No. 10/1983, p. 3.

92. Compare Kiril Konov, Zenka Vasileva and Peter Pejev, loc. cit., p. 499.

93. Ibid., p. 497.

94. In this connection, compare the short notice "Bulgaria invests in telecommunications" in: Computerwoche (Computer Week) No. 18 of 29 April 1983, p. 30.

95. Arnold Grif: "Transmissions from the 1980 Olympiad" in: radio-fernsehen-elektronik (Radio Television Electronics) Berlin (East) No. 7/1980, p. 415.

96. Ibid., p. 415-417 as well as Klaus-Rüdiger Fellbaum (Editor): Telecommunications from A to Z, Berlin 1981, p. 27.

97. Heinz Bergmann, loc. cit., p. 464.

98. Reproduced thus in: "The GDR lacks means for the rapid expansion of the telecommunications network", Information Service West (IWE), Berlin 134. Tagesdienst (Daily Service) 1983, page 2.

99. "The law concerning the 1984 economic plan of 8 December 1983", in: Neues Deutschland (New Germany) of 10/11 December 1983, page 3, as well as Willi Stoph: "A demanding plan oriented towards a large performance rise in the 35th year of our republic", in: Neues Deutschland (New Germany) of 9 December 1983, p. 3.

100. In this connection, compare Wolf-Dietrich Hartmann/Helmut Richter: Routes to top performances, Berlin (East) 1982.

101. In this connection, compare in particular the regulations in GBl I (Legal Gazette) 1982, No. 1, p. 1-5.

102. MMM, abbreviation for "Messen der Meister von Morgen" (Measuring tomorrow's masters).

103. "Leadership example" in: der neuerer (The Innovator) Berlin (East) No. 7 and 8/1983, p. 219. - As regards follow-up use, compare, among others, also "Smartly calculated" in: der neuerer, Berlin (East) No. 7 and 8/1983, p. 224 and 225.

104. "Sixth Congress of the Central Committee of the SED: Orientation of Innovators and Inventors" in: der neuerer (The Innovator) No. 7 and 8/1983, p. 211.

105. Hermann Pöschel: "Rising economic yields from scientific-technical performances" in: der neuerer (The Innovator) Berlin (East), No. 7 and 8/1983, p. 206-209.

106. Compare, in this connection, "Council of inventors for inventors" in: der neuerer (The Innovator), Berlin (East) No. 7 and 8/1983, p. 206-209.

107. Compare, in this connection, the explanations by A. Kerstan: "What can inventor schools do?" in: der neuerer (The Innovator) Berlin (East), No. 7 and 8/1983, p. 222 and 223, as well as in the sources quoted below.

108. Michael Herrlich: "Invention - random or planned?" in: Press Information, Berlin (East), No. 115 of 30 September 1983, p. 4.

109. Ibid.

110. Compare Gerlinde Mehlhorn and Hans-Georg Mehlhorn: "Invention - learnable and teachable" in: Einheit (Unity) Berlin (East) No. 9/1983, p. 750-755.

111. Thus Joachim Hemmerling in an interview. Reproduced in: Information Bureau West, Berlin, Tagesdienst (Daily Service) No. 173 of 24 November 1983, p. 1.

112. Ibid.: "Invention - the route to scientific high performances" in Einheit (Unity), Berlin (East), No. 9/1983, p. 844.

113. On the development of new research strategies in the GDR, compare among others Günter Kröber: Growth trends and development requirements of the research potential in the GDR. Reports of the session of the Academy of Sciences of the GDR, Social Scientists. Edited under order of the President of the Academy of Sciences of the GDR, by Vice President Prof. Dr. Heinrich Scheel. Academic Publishers, Berlin (East), 1982.

114. In this connection compare the explanations concerning an "Academy Colloquium on Basic Research" in: Neues Deutschland (New Germany) of 20 September 1983, p. 2.

115. Otto Reinhold: "Intensive standard production - a revolutionary process" in Einheit (Unity), Berlin (East), No. 8/1983, p. 720.

116. Ibid., p. 723.

8348
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NEW FEATURES OF SCIENCE POLICY OUTLINED

Budapest MAGYAR HIRLAP in Hungarian 17 Mar 84 p 5

/Interview with Istvan Sarlos, chairman, Science Policy Committee, by Tibor Csaszar; date and place not specified/

/Text/ Many government decisions made last year reflect the urgent demand that the supply of useful scientific results and the applicability of research projects should be increased. These measures, which touch on various features and areas of scientific work, will promote the ability of our country, amid economic difficulties, to keep pace with technological progress and give helpful answers to the questions of the present for establishing the basis of the future. Istvan Sarlos, MSZMP Politburo member, deputy premier of the Council of Ministers and chairman of the Science Policy Committee, spoke about the government's efforts and the science policy of the 1980's in an interview with Tibor Csaszar, the MTI correspondent.

/Question/ On the basis of an evaluation by the Science Policy Committee, the government recently reviewed the "half-time" results for carrying out Hungary's research-development plan--the first such five-year work program. As chairman of the committee, what results would you like to draw attention to?

/Answer/ This plan includes the medium term scientific and technical development policy goals of the government, the most important tasks that would serve their realization, and promise of direct, practical results and rapid applicability. Since the drafting of the plan the circumstances for their execution have changed: given the stricter economic conditions it must now meet substantially higher requirements.

To this end we introduced new guidance, organizational, financing and control methods. The goal was to give research and development work adequate support, make the program more flexible, and make it possible for us better to exploit intellectual and material resources. The correctness of these methods will have to be judged in the light of future results. This is certain: We will have to continue working on their perfection if they are to have a permanent effect. All this, however, is only one condition for the success of the long term program; equally important is an increase in the innovative readiness of the

economic organs, which depends, however, on the changing economic circumstances. The fact is that this readiness is growing less than assumed, the economic organizations have been flexible primarily in the market placement of their products while the products themselves changed but little.

Innovation, Incentive

The role of research and particularly of technological, engineering development in the acceleration of economic development has become vital. Therefore, with the productive cooperation of research institutes and the universities, we have devoted greater attention to the research-development activity of the enterprises, and to the strengthening of the now unfolding innovative readiness and capacity of the economic organizations.

Our experiences in medium term, national research-development programs bear witness that there has been significant progress in the more careful selection of research goals and in more rapid adaptation to changes in reality. For example, the research programs which give incentive to energy savings or serve the development of biotechnology date from this plan period, the former in response to earlier, urgent demands and the latter in the interest of establishing goals for the modernization of the economy's structure.

In analyzing experiences for carrying out the government's research-development program, those problems also show up which require the taking of further measures. We have not as yet succeeded in establishing everywhere the framework of independent, innovative activity by the enterprises: as a matter of fact, in some places administration interferes excessively in the organization and guidance of research-development work. Also important is our experience that innovation by government means can be accelerated primarily by virtue of the development and expansion of new, more comprehensive technological and technical development techniques and the strengthening of incentive. In the future, therefore--according to our plans--the center of gravity on our research programs will be in such areas as biotechnology, microelectronics, computer technology, and in social science on the research of economic policy and the structure of society. With this intention to make a change of emphasis the concept of independence of enterprises is being realized more clearly regarding with distribution between the state, the enterprises and other institutions. The essence of it is that in the economy the daily, short term technical development tasks must be solved by the enterprises while the state concentrates on support for research projects to bring about comprehensive development.

Increased Requirements

How successful have been the measures taken in recent years to raise the requirements for scientific work: how has the new, unified research-training system turned out, and the three-level scientific system of grades?

/Answer/ In December 1982 the government passed a resolution on unified researcher training, the goal of which is that professionals preparing for a scientific career should be prepared at an earlier age, in greater numbers, and in the framework of more intensive training at high-level research places for their career which calls for stamina, patience and very profound knowledge. For the first year of the new researcher training program about 700 young persons applied from whom 400 specialists were selected, and according to the new system their training started in September 1983. About 250 had state scholarships, substantially more than the scientific, post-graduate trainees of earlier years. It is noteworthy that 150 of them were young people below 25 years of age and starting out on a career. We can undertake a more comprehensive evaluation of the new system with the end of the first year of the three-year study.

According to the government decree passed in November of last year on the introduction of the three-level scientific system of grades, the deadline for the actual introduction of the new system's university doctorate is 1 September 1984. At present the universities are examining the doctoral rules, the doctoral examination requirements, and organizationally they are establishing the basis for the introduction of the higher level, university scientific degree.

The orders relating to the "scientific candidate" and "scientific doctor" degrees are already in effect; and the rise in the level of requirements on those entering has met with the approval of researchers and scientists. According to the Committee on Scientific Qualifications the "big scramble" for scientific degrees has subsided. There has also been a certain change in the scientific subjects presented by the candidates: Instead of autotelic subjects sometimes presented in the past they are more and more choosing subjects with deeper theoretical demands or applied research in subjects which deal with timely social political questions.

New Organizational Forms

/Question/ What is the thinking about the further organizational expansion of research-development institutions, and how can we give incentive through organizational frameworks to cooperation and joint incentive between research bases and producer operations?

/Answer/ The further organizational development of the research-development institutions is one of the elements of our efforts to promote the success of scientific work. Significant transformations--in many respects new--have begun to take place in the organizational system of the research institute network during the past 3 years. Above all, the measures have been directed at improving the relationship between science and practice, the success of the research, and at making it possible for the research basis to adjust better to changing the increasing requirements.

Certainly the most important advance has been the establishment and expansion of the technical-development enterprise as a new organizational form. The technical-development enterprises have a "mediating" role between the research places and the producer organizations; their primary task is to assemble research results, put them into usable form for development and practice, and promote their applicability as soon and as widely as possible, Innovation is promoted by a regulation system which counts on the risk of failure, creates a joint interest between the researchers and the plant and enterprise experts in making use of the results and achieving market success. There are already over 50 technical-development enterprises, some of which wish to manage the practical introduction of technical results beyond the borders of the country. Many other organizational forms and their combination make it possible to strengthen the relationship of science and practice; these extend from affiliate enterprise organizations to the joint research institute of a number of enterprises, from business work partnerships to the establishment of task force institutes to promote the execution of national research programs. Thus the development of a varied and multifarious institutional network has begun in order to adjust better to the characteristics of the research development network, the new feature of which is greater openness and more flexible adaptability.

Experiences thus far have drawn our attention to the fact that with the organizational transformations we must make better use of the regulation and management means designed to increase the incentive of the research places and the researchers. We need to devote greater attention to the development of the university and enterprise research network. Enterprise and control material means must be devoted to well defined, precisely scheduled tasks, and the financing rather of concrete tasks than of an institution as a whole. With attention to the requirements of science and social practice, we shall work out this year the long term development concept of the research network and put it into operation.

The Discovery of Reality

/Question/ How do the social science research projects contribute, how can they contribute to the realization of our special social programs and to the improvement of the society's guidance system?

/Answer/ The domestic social science research projects embrace the complete functions and operations of society. This is also true in the historical sense; they deal both with the past and with the analysis of future perspective, and of course with research into the present. But they study not only socio-economic relations, conditions and institutional systems but also the characteristics of the people, groups, sub-classes who are the bearers of the above.

It is the basic task of those who work in the social sciences to recognize the main questions of our time and to study them. Despite the strict

scientific commitments of our means and methods, this work cannot be sterile, it cannot be an end to itself. We need Marxist answers for a solution to the actual questions. Therefore, a tremendous responsibility falls on our social scientists: their results are built organically into our ideology, into the consciousness that defines and guides our actions.

The basic function of the social sciences is to discover reality. It is essential that we interpret this reality in its own fullness, its actual complexity, and together with the deep layers that we are not directly aware of. But we must not only describe this reality as discovered, but constantly confront it with the image we have of it, and thus science must undertake a direct consciousness formation role. This function goes with a series of conflicts for it constantly redoes our picture of society, builds new values into it, and tears down old ones; it prompts individuals and small groups, sub-classes, nationalities and nations to change their own self-evaluation.

Society and all its constituent elements strive to maintain a stability and continuity that promotes development, and therefore the newly discovered objective facts of social processes develop and synthesize at one time the conceptual system of the society. The socio-economic processes of recent years have brought to a head profound changes which, however, must complete the process not spontaneously but with the greatest possible sense of guidance and social control. This is why the decision-preparing activity of social scientists is growing greater and the significance of the role they have assumed in analyzing, controlling and evaluating the effects of the changes is increasing.

Continuing comprehensive research will be at the base of our growth in further socialist development and our economic capability. The modalities of further political development, the economic organizational system, the socialist enterprise, the world market influence on the Hungarian economy are being successfully studied. Research which analyzes the social structure, life style; the substance and structure of values; the socialist, nationality and national consciousness; the practice and theory of social policy; population policy; the mechanisms and problems of social participation; and the subject areas of youth policies are outlining a modernizing socio-political conceptual and institutional system. Research in the development possibilities of public education, the teaching system, general education, administration and settlements is establishing the basis to increase the adaptability of our society.

Basic Research Projects

/Question/ With regard to the present situation of the economy, is the material cover for basic research projects assured?

/Answer/ The ratio of money devoted to basic research projects--within material resources used for research and development--has undoubtedly been declining for years: in 1982 it was 13.3 percent as compared to only 11.6 percent in 1982. High-value equipment replacements or new acquisitions have occurred to a very small extent, although without modern equipment it is impossible to achieve high-level results. Workers in economic guidance and technical development have been speaking up more and more on behalf of intensified support for basic research projects. But it is my opinion that we are speaking here not only--or not primarily--of material means and not only of problems in basic research in the more narrow sense, but of the fact that the proper priority ratio and evaluation systems have not been developed, that is, the internally differing phases of science work and of the research-development process are not being handled in an adequately differentiated way. The material problems of basic research, which undoubtedly exist, can be better revealed, I believe, in this context. In science and in technical development only an expected high-level result--in addition to social and economic demands--can be the basis of support, emphasis and preference. But in theoretical and basic research the results are regularly in looser relation with immediate practice than the products of technical development. Thus if the requirements are not conceived in an adequately proportional way and a one-sided advantage is given to economic applicability in the entire process of science and research development, sooner or later value or valuation problems will arise.

Today the moral and material recognition of society goes primarily to research-development activity that brings a practical, economic benefit. At research places they now contribute primarily to the material rise of a collective working on subjects and orders that have been put by practice. This leads among the researchers and research places to value problems and undesirable value conflicts; the danger exists that there will be a looser than desirable link between sciencitic achievement and material recognition. In the future, therefore, we must make it more clear how much and what type of responsibility and tasks the state will undertake in basic research and development. We must also think through what steps must be taken in the interest of more differentiated judgements in the field of supports, regulation and evaluation. One thing is certain: We must strive to see that everywhere adequate attention is devoted to basic research projects, because the results that can be achieved in this area have an indispensable role in establishing the basis of the future. And now we have to prepare for the expected economic upswing in order that we can always act rapidly, decisively and without haste.

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CZECH COMPUTER INDUSTRY

Budapest SZAMITASTECHNIKA in Hungarian Jan-Feb 84 p 3

[Article by Margit Takacs: "The Czechoslovak Computer Technology Industry"]

[Text] At the beginning of December, the Datasystem and Computer Technology Applications Enterprise in Slovakia held a 3-day series of lectures in the course of which those interested could become acquainted with computers belonging to the MSZR [Minicomputer Technology System], and with the software products and applications systems developed for them, and at the exhibits they could see the SZM-4 computer of the State Census Office and the programs running on it.

In our article we would like to give a brief review of the computer manufacturing industry of the neighboring socialist country, noting especially those new hardware and software products which may be of interest to domestic users.

Czechoslovakia is the third largest foreign trade partner of our homeland. Our computer technology import is worth about 5 million rubles per year.

A number of the products of the Czechoslovak computer technology industry have been well known for a long time, Hungarian users use them--for example, the SZM-4/20 minicomputers, various punch card and punch tape input/output devices, console typewriters and graphic machines.

Since 1981, the institutions dealing with the development, manufacture and trade in computer technology products in Czechoslovakia have been combined in the Automation and Computer Technology Concern (trust) ZAVT (Zavody Automatizacie a Vypoctovej Techniky). The concern has about 55,000 workers and about 30,000 of them deal with computer technology. Enterprises belonging to other concerns (for example, TESLA) manufacture only a few special-purpose computer technology products in small series.

The computer technology manufacturing industry has two chief trends. One is the manufacture of medium-category computers (ESZ 1025 and ESZ 1026) and the

various peripherals for them (line printers, punch card machines, console typewriters, data preparation terminals) and the other--the bases of which are primarily in Slovakia--is the development and manufacture of mini and microcomputers.

New MSZR Products

The SZM-3/20 machines belonging to the MSZR I series are used only in Czechoslovakia but the SZM-4/20 is well known in many other countries as well. As of the end of 1983, 65 of the 300 machines manufactured had gone abroad, 12 of them to Hungary.

The Computer Technology Research Institute VUVT (Vyskumny Ustav Vypoctovej Techniky) is in Zilina in northern Slovakia. Its staff of young experts developed the SZM-4/20 minicomputers. Manufacture takes place in the Namestovo factory unit of the Zavody Vypoctovej Techniky in Banska Bystrica; the firm guiding software development and providing customer service is the Datasystem enterprise with headquarters in Bratislava.

The first SZM-4/20 machines were delivered to Hungary in the fall of 1981; By the end of 1984, 20 Czechoslovak SZM-4/20 machines will be working in Hungary.

The chief characteristics of the minicomputer are: 256 K bytes capacity, semiconductor, operational memory with self-correcting circuits, a floating-point arithmetic unit and word length of 16 bits. The operational memory works very reliably; there has not yet been a memory error in the course of applications in Hungary going back 2 years.

The machine is delivered with a DOS RV V.2 multiprogrammed operating system. One can connect to it four 5 M byte cassette magnetic disk storage, the same number of magnetic tape units and 29 M byte magnetic disk units. Use of 100 M byte disks is under development. The machine can be expanded with a 8-16 line multiplexor. (Beginning at the end of 1983, they will manufacture a V.24 version with a circuit loop solution.)

Development of machines belonging in the MSZR II series began in 1980 and was completed in the recent past.

The newer products include the SZM-50/50 microcomputer, which can be regarded as a "miniaturized" version of the SZM-4/20. It has an operational memory of 128 K bytes and a combined semiconductor memory (16 K RAM and 12 K EPROM), it has a 4-line asynchronous adapter; it does not have floating-point arithmetic. Economical use of the operational memory is aided by a cache memory which has a capacity of 1 K words, an access time of 85 ns and a word length of 27 bits. The machine is delivered with the FOBOS-2 operating system.

The SZM-52/11 can be regarded as a 3.5 generation minicomputer compatible from below with the SZM-4/20; it was approved earlier with a 256 K byte memory capacity but in November 1983 a machine with an operational memory of 1 M bytes was approved also.

Its 1 K word capacity cache memory makes it a good bit faster than the SZM-4. It has a rewritable microprogram store, internal microdiagnostics and wired floating-point arithmetic. (As an option one can also use a floating-point processor.) It can be expanded with an 8 and 16 line multiplexor and 100 M byte disk units can be connected.

According to the plans, series manufacture of both the SZM-50/50 and SZM-52/11 will begin this year.

Development of the MSZR III series will begin this year also. The plans include--among other things--expansion of the SZM-50/50 with a floating-point processor, the development of the SZM-52/12 32 bit computer on which one will be able to run program systems written for the previous 16 bit machines, but its performance will be greater than that of its predecessor by an order of magnitude.

Software

They have developed a number of goal-oriented software products for the SZM-4/20 and the SZM-52/11.

We should stress the agricultural system which was developed for ESZR and MSZR machines with state support of 100 million crowns. The software system for guiding agricultural operations can be used on the SZM-4/20 and SZM-52/11 machines but it will run on other computers in the MSZR II series also. This system consists of six integrated and connected subsystems with nearly 200 programs. They prepared programs for, among other things, the reproduction of swine and cattle stock, veterinary service, egg production, operational guidance of hauling, feeding, planning grain production, processing stockpiles, assets and contracts, analysis of economicalness, etc. The development of systems for real-time guidance of technological processes suitable for automation (for example, feeding cattle and swine, climate control of greenhouses, control of drying equipment) is in the initial phase; development and practical tests will probably be completed by 1985.

An interactive graphic system developed for the SZM-4/20 and SZM-52/11 machines can be used in a number of areas of the economy, for example, in the electronics industry, in construction, in mechanical design, in the textile industry, etc.

Special peripherals aid graphic design. The SZM-7405 graphic vector terminal can be built into the graphic design system in two ways--directly onto the common bus system or via the SZM-4/20 processor, as a host-satellite system. Use of a light pen aids the interactive work also.

The Digigraf 3.5 G 1712 and 1208 automatic graphic machines can be used in the online and offline modes. The drawing table of the 1712 equipment is 1,682 by 1,180 mm and that of the 1208 is 1,189 by 841 mm. The online connection is provided not only on the ESZR machines but also, for example, on the SZM-4/20 and SZM-52/11 machines as well. In the offline mode, the system can operate from punch tape and from floppy disk. Its precision is 0.01 mm and the

maximum writing speed is 400 mm/s. The manufacturing enterprise is Aritma Praha.

The graphics applications system includes program packages supporting the preparation of construction and mechanical documentation, maintaining and continual updating of public utility network archives, planning road and tram networks and automatic design of printed circuit cards and integrated circuits.

Peripherals and Microcomputers

The research institute in Zilina which developed the SZM-4 minicomputers introduced at the fall 1983 fair in Brno a family of microcomputers based on the MHB 8080 or the MHB 8080A microprocessor.

The SMEP 01 general purpose microcomputer has a 32 K byte operational memory, tape recorder background storage and a graphic screen with a resolution of 256 by 256; it can be programmed in the BASIC language and the recommended Czechoslovak price is Kcs 29,000.

The SMEP 02 has 40 to 64 K bytes memory and works with a cassette magnetic tape unit with a maximum 200 K bytes capacity. It can be programmed in the BASIC and COBOL languages and the recommended price in Kcs 60,000.

The SMEP 03 has 60 K bytes RAM and 4 K bytes EPROM; it is a professional microcomputer working with 5 1/4 inch floppy disk units, can be programmed in the BASIC, FORTRAN and COBOL languages. They plan to trade it at a price of about Kcs 130,000.

Series manufacture of the members of the SMEP family will begin this year.

Series manufacture of the ESZ 1026 computer, in the ESZR II series, has begun in the ZPA Cakovice factory in Prague. The May 1983 issue of our journal reported on the testing of the machine, together with its chief characteristics and properties. One ESZ 1026 is being put into operation in our homeland, at the SZAMALK [Computer Technology Applications Enterprise]--for reference purposes.

In regard to peripherals, the already mentioned Aritma Praha is the best known manufacturing enterprise among Hungarian users. A new product in its manufacturing program is the ESZ 5080, large capacity, 100 M byte magnetic disk unit. Zbrojovka Brno is the manufacturer of , among other things, the CONSUL 321.1 electronic teletype, the CONSUL 2113 line printer, the CONSUL 2714 programmable data preparation terminal for magnetic disk data input and the CONSUL 7113 floppy disk store.

Last of all, let us mention a background storage unit which was the surprise of the fall 1983 Brno fair. The most noteworthy feature of the MMP 45 small magnetic tape unit is that its write density can be switched from 800 bit/inch to 1,600 bit/inch. It uses the NRZI and PE writing modes and can be connected to MSZR machines.

A few technical data: number of bands, 9; transmission frequency, 36 and 72 K bytes/s; tape width, 12.7 mm; disk diameter, 266 mm, weight, 59 kg; and size, 619 by 482 by 450 mm. It is manufactured by ZPA Dukla Presov.

The KOVO Foreign Trade Enterprise deals with export of Czechoslovak hardware products and the Polytechna Foreign Trade Enterprise deals with export of the software products.

8984
CSO: 2502/35

BULGARIAN IZOT COMPUTER

Budapest SZAMITASTECHNIKA in Hungarian Jan/Feb 84 p 3

[Article by A.K.: "IZOT in the SZAMALK"]

[Text] The youngest branch of the Bulgarian computer technology industry, minicomputer manufacture, was introduced between 28 November and 2 December in the Vahot Street exhibit hall of the SZAMALK [Computer Technology Applications Enterprise].

In the center of the exhibit stood a large IZOT 1016 C computer. The exhibited configuration was equipped with 196 K bytes operating memory, 2 x 2.5 M byte and 29 M byte capacity magnetic disks, magnetic tape, and console typewriter. As a sign of Bulgarian-Hungarian cooperation a Videoton printer and ORION displays were connected to the computer. In addition to the well known SZM-4 peripherals the Bulgarian experts provided some special features--a 9-line asynchronous adapter, a synchronous multiplexer and an ESZR-MSZR channel-channel adapter. They demonstrated the utility of the latter by setting up a link between the IZOT 1016 C and the SZAMALK SZM-4 or ESZ 1055 computer.

It was the deliberate intention of the exhibit to go beyond the rigid hardware sale view. The developers offered exhibits in two theme groups. One can be used in agricultural operations and the other in hospitals and health systems.

At the press conference held in the course of the exhibit, the participants could get a picture of the prospects of the developments. Within the framework of the computer technology cooperation of the socialist countries, the IZOT association is working primarily on the development of magnetic disk stores. (To do this, however, it will be necessary to increase the throughput of the SZM-4.) One cannot imagine the use of such large-capacity background storage without fast magnetic tapes. In this area, they promised the appearance of large spool magnetic tape units with spooling speeds of 1 and 2 m/s, using the NRZI and phase-coded writing method.

In regard to the manufacturing background we could become acquainted with the chief line of the operations of the 130 enterprises of the IZOT State Economic Association and the activity of the Elektronika factory. We could learn that the first model introduced at the 1980 Plovdiv fair has been followed since then by 250 of the IZOT 1016 computers, at present the most extensively used computer in Bulgaria.

On the basis of the success of the exhibit and the expressions of interest we can count on the Bulgarian SZM-4's appearing with Hungarian users in 1984.

8984
CSO: 2502/35

PURPOSE, ACHIEVEMENTS OF MINICOMPUTER SYSTEM

Budapest SZAMITASTECHNIKA in Hungarian Jan/Feb 84 p5

[Article by Sandor Hauszmann, leader of the MNK-MSZR (Hungarian People's Republic-Minicomputer System) Secretariat: "The Purpose in Establishing and the Chief Achievements of the MSZR"]

> [Text] With the realization of the ESZR [Uniform Computer Technology System] and MSZR programs, the domestic stock of computer technology devices went through changes which prove unambiguously the positive change in ratio of domestic and socialist products manufactured within the framework of these programs. Our journal, as an official organ of and organic part of the computer technology information infrastructures, has aided this program with its own tools since the establishment of these programs.
>
> In order to provide more timely information to users and to our readers, we are now starting two new columns--MSZR FT and ESZR FT news--which will be prepared with the aid of the domestic secretariat of the ESZR and MSZR Chief Designers Council (FT). Thus the reader can get first hand and in the fastest way information about professional news which is accessible to the general public. We hope that the columns, which will appear alternately every month, will become, after their introduction, a publication forum which participants in the programs will use as a primary source of information in the course of planning their work and tasks. --The Editors.

The MSZR FT was established in 1974 by the Computer Technology Intergovernment Committee in the interest of coordinating development work in the area of minicomputers in the countries party to the agreement and in the interest of developing a uniform technical policy.

On the basis of the MSZR I Series Developmental Conception adopted by the MSZR FT in 1975 and the developmental plan agreed on in 1976 the development of the technical and program tools prescribed in the developmental plan for the MSZR I series was realized in the period 1977-1979. A significant number of MSZR hardware devices (104 items of equipment) and software tools (28 program

systems) were developed and tested and this ensured the introduction of the required minicomputer systems in various areas of the economies of the member countries.

We must mention as an essential characteristic of the cooperation that as a result of expert work we succeeded in developing a uniform system which ensured the mutual use of peripherals developed in different countries in the computer systems being developed and in this way the several countries were not forced to develop and manufacture the entire range of computer technology tools.

Our country participated in the MSZR I series only in the development of peripherals (line printers, displays, terminals, modems, fixed head and floppy disk stores, punch tape readers and punches and punch card readers) since the features of the ESZ 1010 computer manufactured by Videoton within the framework of the ESZR surpassed the parameters of the computers of the MSZR I series.

During this period there was international testing of 13 devices from Videoton and of 5 devices from MOM [Hungarian Optical Works].

In addition to developing central units the other member countries carried out primarily a further development for MSZR purposes of the peripherals manufactured traditionally as part of the ESZR.

Bulgaria: cassette and floppy disk stores and magnetic tape stores.

Czechoslovakia: mosaic printer, cassette and floppy disk stores, display.

Cuba: alphanumeric display.

Poland: cassette and floppy disk store, cassette magnetic tape store, mosaic printer, punch tape station.

GDR: mosaic printers, data collection equipment.

Romania: line printer, card reader.

Soviet Union: a graphic display in addition to the complete computer line.

The countries developing minicomputers were primarily responsible for development of basic software; the division of labor was more proportional in developing applications software.

The experiences acquired in the several countries by 1979 in developing, manufacturing and using MSZR tools made it possible to formulate the tasks of the developers for the next period, between 1980 and 1983. Within the framework of the MSZR FT they developed a Developmental Concept and Plan for the MSZR 2 series, which prescribed the achievement of the following goals as compared to the first series:

--large series manufacture;

--preserving compatibility with the developments of the MSZR I series;

--exploiting the possibilities of a new element base (microprocessor families, LSI);

--development of multicomputer and multiprocessor systems;

--increasing the reliability parameters;

--improving the technical-economic indices of the devices to be developed;

--developing microcomputers and special processors;

--creating more modern operating systems; and

--creating software tools oriented toward a significant reduction in the programming expenditures for applications tasks.

In harmony with the developmental plan for tools in the MSZR 2 series pertaining to 1980-1982, the countries party to the agreement developed and jointly tested 102 hardware devices and 31 program systems.

In this period our homeland (Videoton) tested and had approved the largest capacity computer of the MSZR thus far (the SXM-52/10), two new types of line printer, two displays, one floppy disk data preparation device and two operating systems for the SZM-52/10 computer.

On the basis of the developmental conception for the third series, adopted by the MSZR FT in 1982, harmonization of the developmental plan for the MSZR 3 series, containing the tasks to be carried out in 1984-1987, is nearing completion in the MSZR expert sections.

To sum up, we can state that the MSZR has fundamentally fulfilled the hopes entertained for it.

Evaluating the period which has passed from the viewpoint of our homeland it can be stated that the developmental goals posted for Hungary have been realized, and the developmental results achieved have provided equipment at the proper level to expand the traditional--and specialized--peripheral assortment of the Hungarian computer technology industry; at the same time, a high-performance minicomputer system corresponding to the Hungarian minicomputer manufacturing profile has been developed. All this has strengthened the positions we occupy on the export markets and thanks to the MSZR program it has been possible to expand the variety of domestic supply by the import of MSZR computers.

Table Summarizing the Participation of Our Homeland In the MSZR Development

Series number	Designation	Code number	Developer	Year of approval
1.	Alphanumeric display	SZM-7206	Videoton	1977
2.	Small line printer (80 column)	SZM-6316	Videoton	1977
3.	Alphanumeric line printer (132 col.)	SZM-6321	Videoton	1977
4.	Fixed head disk store	SZM-5500	MOM	1977
5.	Punch tape reader	SZM-6203	MOM	1977
6.	Punch tape punch	SZM-6227	MOM	1977
7.	Punch tape station	SZM-6200	MOM	1977
8.	Punch tape operating system for the	SZM-3,SZM-4	KFKI	1977
9.	Card reader	SZM-6101	Videoton	1977
10.	Alphanumeric video terminal	SZM-7219	Videoton	1977
11.	Floppy disk store	SZM-5601	Videoton	1977
12.	Floppy disk external store	SZM-5606	MOM	1979
13.	Intelligent alphanumeric video term.	SZM-7401	Videoton	1978
14.	Point raster graphic video terminal	SZM-7301	Videoton	1978
15.	Alphanumeric line printer (900 lines/m)	SZM-6306	Videoton	1978
16.	MODEM 200	SZM-8101	Videoton	1978
17.	MODEM 600/1200	SZM-8102	Videoton	1978
18.	MODEM 1200/2400	SZM-8103	Videoton	1978
19.	Remote processing terminal (RPT-80)	SZM-9105	Videoton	1979
20.	Alphanumeric line printer (660 lines/m)	SZM-6313	Videoton	1979
21.	SZM 52/10 high-performance minicomputer	SZM-1501	Videoton	1980
22.	Floppy disk data preparer	SZM-6905	Videoton	1980

23.	Tape line printer (300 lines/minute)	SZM-6311	Videoton	1980
24.	SZM-52/10 computer basic software (unique mode)		Videoton	1980
25.	SZM-52/10 disk operating system in the emulation mode		Videoton	1980
26.	Terminal station	SZM 1501, 7406	Videoton	1981
27.	Alphanumeric picture screen	SZM-7211	Videoton	1982
28.	Alphanumeric video terminal with expanded editing possibilities	SZM-7212	Videoton	1982
29.	Tape line printer (600 lines/minute)	SZM-639	Videoton	1982

The catalog of SZM-3 and SZM-4 technical and program tools contains more information about MSZR hardware and software tools. It is published by the MCNTI (International Scientific and Technical Information Center), Moscow, 1981. It appeared in 4,000 copies; its price is 1.50 rubles. It can be obtained in the professional book stores of the Soviet Union.

8984
CSO: 2502/35

MOM OFFICIAL WRITES ON MICROPERIPHERALS

Budapest SZAMITASTECHNIKA in Hungarian Jan/Feb 84 p 6

[Article by Tamas Kertesa, MOM (Hungarian Optical Works): "Microperipherals"]

[Text] A new concept has gained currency in the Hungarian computer technology profession. After the microprocessor, microprogramming and microcomputer we are hearing ever more frequently about so-called "microperipherals." What does this concept cover and why is it so important to follow it today? What achievements and problems have appeared in the area of microperipherals thus far and what can be expected in the near future? In this article we will try to find answers to the above questions.

The swift spread of microcomputers and microprogrammed control units in the leading capitalist countries in recent years has created a gigantic variety of small desk devices. The small size, cheap but high-performance stores and input/output devices belonging to these computers are known by the collective name "microperipherals."

If someone is curious about the entire range of microperipherals, it is enough to study, for example, the peripheral assortment for a well put together personal computer. One can find here a keyboard, picture screen, various versions of floppy disk units, small printer, a disk unit working with Winchester technology, identifying peripherals and analog-digital sensing and intervention organs. Since these devices constitute organic parts of computers with a very large market, an entire branch of industry has grown up to produce them, with a suprisingly swift and flexible development and introduction of manufacture. The results can be seen already. A few hundred specialized firms manufacture several million microperipherals per year and the market research institutes are indicating further swift growth.

Microprocessor-based devices developed here have spread like mushrooms in our homeland, too in the past 2 years. The construction, services and peripheral assortment of these correspond to the known Western types. But what has been done here so far by a developer of personal computers, for example, to provide an entire range of microperipherals?

In the first place he had to decide to develop a machine similar to some leading type. If he could get the electronic parts needed for development he built his machine and the peripheral connections. All that was needed for this was a domestically produced keyboard and a television, or a picture screen unit he made himself. Now it became possible to partially test the software developed or acquired.

And here came the first problem. Since he wanted to build a professional machine he absolutely had to have disk units and a printer.

Obtaining these was not so simple. The more clever developers could get a few prototypes even given the tight foreign exchange possibilities. So the system could be tested, the needs measured and manufacture prepared for.

And then came the second problem. It was possible to get a keyboard and picture screen somehow, but how to provide the many hundreds or even a thousand disk drives and printers?

The demand for microperipherals, as in the Western example, increased greatly from one day to the next. So satisfying this demand is one of the keys to the domestic spread of the microcomputer culture.

Let us take a look at a few of the domestic possibilities at present.

The MOM already manufactures the disk drive units needed for personal computers. In addition to the MF 3200 and MF 6400 8-inch floppy disk units series manufacture began this year of the MF 1800 mini-floppy drive also. Creating these devices required a high-level precision engineering culture and ensuring the conditions for their series manufacture required great effort. Since the device requires the combined presence of many types of techniques, much cooperation and special import materials this means, under present conditions, that the domestic demand for floppy disk drive units far exceeds the manufacturing possibilities of the enterprise today.

Despite all this, the MOM is trying to meet the swiftly growing demand (it is characteristic of this, for example, that the demand for mini-floppy disk units increased 10 times in 1 year), but to do this it had to develop, on its own, a number of techniques unknown at the enterprise before. In addition to learning and developing the stepping and drive motors, magnetic head, electromagnets, highly reliable filters and amplifiers and electronic technologies, it was necessary to create static and dynamic testing equipment.

As a result of this, the manufacturing series size planned for 1984 is reasurring for system developers and will make possible the domestic spread of the microcomputer culture with manufacture of floppy disk drives taking the place of import.

The difficulties in obtaining small printers are well known to every system producer. A few of these fundamental microperipherals can be acquired for foreign exchange, but it is already necessary to organize domestic manufacture of many

thousands. In addition to many domestic license purchase attempts, there is a successful initiative in creating the MP 80 desk matrix printer, which was developed jointly by the SZKI [Computer Technology Coordination Institute] and the MOM. The MOM has already worked out the technology for series manufacture of the printer and a test series was manufactured in 1983. In the course of creating the conditions for series manufacture, the difficulties known with the floppy disk devices appeared again, and were made more serious by having to acquire parts only for capitalist foreign exchange until the import parts are replaced. Under present conditions, this puts an especially heavy burden on the MOM. A significant part of the import parts can be replaced, but this still requires continual developmental work.

Here are a few interesting things about the microperipheral developments taking place at the MOM.

The further development of the mini-disk should be mentioned. In the course of this the MOM is preparing for manufacture of the MF 4001 type 0.5 M byte capacity, half-height mini-disk unit. Series manufacture will begin in 1984.

Development of a half-height, two head, 1 M byte capacity mini-floppy unit is under way also. These devices correspond to similar types of the leading capitalist firms in their dimensions and connection parameters.

One of the exciting microperipherals is the Winchester disk. It is exciting to developers and users alike, but can we produce such devices on our own with minimal import parts?

They are seeking an answer to this question at the MOM, too, and reassuring research and development work is being done.

Domestic information-carrying disk units, the magnetic heads, the drive and the special precision engineering raise many technical problems. The experiences in manufacture of fixed and floppy disk units, already being produced in series, will help solve these problems. Preparation for manufacture will begin this year.

The large enterprise form, which has proved outstandingly suitable thus far for continual manufacture of valuable devices in large series, is now more and more capable of reacting to swiftly appearing and changing needs, such as the domestic computer industry is posing in regard to microperipherals. The MOM will also use the possibilities given by small undertakings. For example, an enterprise economic work group called "MOM-Microperipheral" had a part in the introduction of manufacture of peripherals in 1983.

The pace of product and manufacturing development which can be experienced at the leading capitalist firms in the area of microcomputers and microperipherals is enthralling. As a result of material acquisition, cooperation, background industry possibilities and commercial activity embracing the entire world they work under different conditions than the domestic enterprises.

At the same time there have been significant developmental achievements in our homeland also. Many large enterprises, institutions, cooperatives and small undertakings were capable of developing various types and designs of computers.

The manufacture of microperipherals, in addition to these, will require the development and introduction of special technologies and preparation for large series precision engineering manufacture.

As a result of this, it is unavoidable that manufacture of developed microperipherals will begin later than that of the electronic units.

Together with all this, it can be sensed that significant progress has been made recently in the domestic development and manufacture of the most important microperipherals and these devices, taking the place of imports, will make possible the further spread of the computer technology culture.

8984
CSO: 2502/35

ROBOTRON MICROCOMPUTER IN HUNGARY

Budapest SZAMITASTECHNIKA in Hungarian Jan/Feb 84 p 13

[Article by Imre Gaman: "The Robotron A 6402 Microcomputer System in Hungary"]

[Text] The A 6401, as the first member of the A 6400 series of microcomputer systems belonging to the product program of the "decentralized data technology" of the Robotron Kombinat, was introduced on the Hungarian market 2 years ago, followed by the A 6402 based computer systems (analogous to the SZM-4 or PDP 1140). In addition to machine-oriented software adapted to the hardware configuration, the marketing concept includes user projects or program packages adapted to the needs of the user. In the course of selling and installing the systems, Robotron is working with Hungarian partners, making use of experiences acquired in the GDR and other countries. In working out the program packages delivered by Robotron, a part is played by organizational institutes in the GDR which can offer software solutions which can be used in various areas and which have been developed and tested for medium and small operations. A special role is played by the ORT (Organization and Rechentechnik) in Karl Marx Stadt which has great experience in working out and maintaining solutions used in various branches of industry and in medium-size agricultural operations in the course of which it has gained significant experience in Hungary also.

A symposium was held on 29 November of last year in the Cultural and Information Center of the GDR where some of the complex services mentioned were described. In addition, Hungarian users, such as, for example, the NEFAG (Nagykunsag Forest and Wood Processing Farm, Szolnok) and the Medicor Works, reported on their experiences with the hardware delivered by Robotron and with running the software (MAWI 1600 or their own user program packages, current accounts and bookkeeping). The report on Robotron's concept for microcomputer remote processing also aroused great interest. After 2 years of intensive market activity there are now 23 A 6400 systems in the hands of Hungarian users (11 of these are A 6401 and 12 are A 6402). Beginning in 1984 the Robotron offering will include the equipment needed to realize remote processing-multiplexor, concentrator, modem, GDN and intelligent and conversational terminals. The first such system has been delivered already (to Ikarus) and will be put into operation shortly. It is also possible to connect into larger computer systems.

The A 6402 type system will figure in the manufacturing program of the Robotron Kombinat for a long time, taking into consideration technical progress and the

changes and expansions needed to satisfy user needs.

Together with their partners, they have analyzed the experiences gained in the first years, with special regard to the problems of technical and applications customer service, and taking this into consideration with the contracts, it seems certain that users of Robotron microcomputers will receive flexible support of suitable quality.

The systems are sold on the Hungarian market by the ITV [Information Technology Enterprise] and MIGERT [Instrument and Office Machine Marketing Enterprise] with varied services. The ITV provides the equipment and service throughout the country with engineers and technicians trained by Robotron in the GDR. In order to ensure a fast parts supply, the ITV has a relatively large consignment warehouse. A special damage contract ensures that a short time is required for personnel and parts support by Robotron. Software supply is ensured also by a contract with the ITV and MIGERT, bringing in the organizational institutes. They include in machine-oriented software supply, consulting, connected with system programming and development of branch-oriented user systems, such institutes as the EGSZI [Institute of Construction Management and Organization], the MUSZI [Office for the Organization of Agricultural Business Management], FAINFORG [expansion unknown], and the PM SZUV [Computer Technology and Management Organization Enterprise of the Ministry of Financial Affairs]. Robotron or its partner in the GDR installs directly the program packages developed and tested in the GDR.

Beginning in 1984, the training for the system of the software experts of partners and users may be done throughout Hungary as organized by the Industrial Leader Training Institute in Esztergom and the trading partners. In addition, the training centers of Robotron are available for special study courses. Technical training will continue to be in the GDR. There is a special study course to give users an overview of software solutions.

The following problem-oriented software solutions figuring in the Robotron offering may be most significant for the Hungarian market:

--PLSP 1600, Planning and guiding production

This program package makes it possible for a user to plan the entire manufacturing process according to products, product groups and those bearing the cost and to make swift changes in the event of deviation from the plan or as needed as a result of external factors.

--TEVO 1600, Technical preparation for manufacture

With the aid of this program one can achieve great flexibility in the area of technology.

--POP 1600, Production optimization

This makes possible the optimization of product offerings, production planning,

capacity utilization, use of raw materials and auxiliary materials etc., for example, with the target function of maximum profit.

--OPTI 1600, Linear optimization

This makes possible, among other things, the optimization of cutting pictures, pattern models, transportation lines and mix ratios.

--INFO 1600, Information system

This makes possible the compilation and systematization of various information systems and the retrieval and printout of information according to various concepts.

--MAWI 1600, Material management system

This makes possible the management, guidance and accounting of all material management in a plant. On-line terminals facilitate the work of various organizational units.

--AURIS 1600, Automatic occupancy and information system

With the aid of the AURIS program package for individual hotels or hotel chains it is possible to record and keep account of occupancy questions, problems during a guest's stay and various services and to prepare statistics and various evaluations.

A number of these systems are being run by Hungarian users or they are in the process of being installed. Some users are using systems prepared by themselves or by a Hungarian institute or cooperative, or they intend to use systems under development.

8984
CSO: 2502/35

CURRENT DEVELOPMENTS IN PHYSICS REVIEWED

Cluj-Napoca TRIBUNA in Romanian 29 Mar 84 p 3

[Interview with Prof Victor Mercea, corresponding member of the academy, by Constantin Cublesean; date and place not specified]

[Text] [Question] Professor Mercea, in January you celebrated your 60th birthday in a life generously and passionately dedicated to the noble pursuit of scientific research. How about starting from the beginning, January 1924, in Timisoara.

[Answer] I should of course start with the biographical data, which however, after all these long years, appears faraway and lost in the dimness of memory. At one time, at the beginning, my grandfather, the engineer, had a decisive influence on my life, and it is ultimately due to this strong impetus that I became a physicist, out of desire and conviction. Much later however, I realized that I was inescapably a professor and guide, a trait which comes directly from my father. And above all, a sunny nature, full of life and gladness to be alive (don't forget that I was warmed by the Banat sunshine), my mother's marvelous nature. What can I add? That my ancestors come from the hillsides of Tara Motilor, both east and west, and that this has stamped our destiny for better or for worse.

[Question] What sort of teachers did you have, especially for mathematics and physics?

[Answer] School years are formative years. Although inevitably significant, the question nevertheless remains whether school has in itself and always played a predominant role. During the first four years, our teachers, the Moldavian Atudorei from Tirgul Frumos, and the Oltenian Stoicanescu from Romanati, two absolutely exceptional men, at least for me, taught me to speak and write, that is to express myself and think clearly and in an orderly manner for all my life. I don't believe that anything could be more valuable at the start. Later, the school years were routine, and at times even dingy and banal. It was said that in those years, the C. D. Loga High School in Timisoara was the best. With very few exceptions, I did not feel it. But as a whole, the Timisoara environment did have extremely positive factors. It

was a city that was growing rapidly, beautifully, in a very western way, and quite open to the world. Almost without realizing how, I was speaking five languages fluently, three of which could almost be learned in the street. The school years, especially the last three, were predominant. With a long engineering tradition in the family (four generations), my obvious dream was of a technical career. But at the age of 16, my orientation changed completely. The fault lies with "Modern Physics" by K. Darrow. Consternation in the family, consternation at school. As son of intellectuals, as a city boy, from the bourgeois perspective of those days you might say, there were only three professions with a future--doctor, engineer, or lawyer. To want to become a physicist was an aberration! The boy will starve to death, what is this physics? Maybe their resistance hardened me, I don't know. I literaly devoured thousands of books borrowed from the Timisoara Municipal Library, which at that time had books "fresh" from everywhere the world. Science as well as literature, the arts, everything. At the age of 15, on a sort of balcony whose use I had perverted, I scraped together a laboratory with some 16-20 projects of which I was proud: they all worked. When I finished high school I did not yet know what I would do with physics. But there was no doubt that it was the only path I could follow.

[Question] To complete your studies you entered the University of Cluj, where in 1946 you obtained your degree in mathematics, and in 1947 in physics. Can you tell us about the scientific, research, and the general student atmosphere of that time?

[Answer] Those student years were spent under the brutal sign of the war, in a ravaged world with overturned values, whose main significance was destruction. I started, without conviction, as a student in electromechanics at the Polytechnical Institute. But I was dreaming only of physics. At the same time I enrolled in the mathematics department of the School of Sciences. And the rest of the time I worked in the physics laboratory. Fortunately for me, it is as if all of these things were brought for me as refugees, from Cluj to Timisoara. I thus did four years of engineering, which at that time I hated. Subsequently, I realized that I owed a great debt to engineering, especially a technical thinking process which I retained all my life. I unfortunately did not finish this schooling, because in 1946, together with my degree in mathematics, I had the unhoped for chance to find a physicist position at the University of Cluj, which had returned to its Ardeal homestead. With these, my life's adventures returned to their origins. One year later, my dream was fulfilled: in 1947 I received a degree in physics! A verry tortuous road. Both at the Polytechnic and at the University I had great teachers: Professors Remus Radulet, Aurel Barglezan, Marin Banarescu, and in mathematics Th. Angheluta, D. V. Ionescu, Caius Iacob, and D. Calugareanu were not only eminent teachers, but in particular, excelled in their scientific work, in their creations, which for us students, was the only criterion for value. But the physicists especially--Professors Victor Marian, Radu Titeica, and Aurel Ionescu, represented for me almost inaccessible heights. I believe that the respect I still have for them, after all these years, has remained unscathed, and has even grown. It was not merely a school of science, of physics, but first and foremost a school of living.

[Question] In 1956, you became group leader at the Atomic Physics Institute in Cluj. Atomic physics at an international level in Romania, barely 50 years after Vlaicu's first flight, seems like a miracle. But it was not.

[Answer] Actually, it was in 1954 that I was entrusted with the physics group, first as the Subsidiary of the Cluj-Napoca Academy, then transferred in 1956 to the Bucharest Atomic Physics Institute as its Cluj subsidiary (the only one at that time). But we must not overrate this position: we were three full-timers and six half-timers (who were also working at the University). Still, we had the essentials: several rooms in an unfinished building on Donath street, in the middle of a splendid field of clover, guarded on the unfinished side by a sort of "mine" which harbored several families of owls; in other words, an extraordinary freedom of movement. Added to this was a project, whose ambition still makes me shudder: isotope separation! I remember that several years earlier we had succeeded in performing an outstanding experiment: physical separation of methane gas from hydrogen in an installation built completely in Cluj, which worked beyond our expectations. This opened an extraordinary prospect: heavy water production. An inspired initiative on the part of Prof Horia Hulubei, to enter this field of capital importance for nuclear energy.

At that time only a few laboratories in the world were working on such problems. There also existed American industrial installations which I could see in photographs taken from far away. This was one of the key points of the atomic secret in the 1950's. We were entering an absolutely new field, and we fortunately did not have time to think too much about the temerity, not to say absurdity, of this initiative. Of course, we blithely made gross mistakes at the beginning. But we rapidly obtained data, fragments of information, and the collective grew and worked with unbelievable enthusiasm, in three shifts, day and night. We quickly had 30-40 people, we created a shop, and I can say that working side by side with an excellent team of mechanics was one of the keys to success. But for us, the essential point was not to produce a few drops of heavy water; others had already demonstrated that. It was to find an industrial production process for this liquid, which is an entirely different problem. Among the very few and hermetic laboratories which attempted this work, in 1962 we produced continuously the first Romanian heavy water!

[Question] You were particularly fascinated by molecular research of gases. Why exactly?

[Answer] I undertook the study of molecular processes out of need and from an intimate conviction. At that time, the sciences with priority were physics and nuclear technology, which was solidly entrenched in Bucharest. What was left for us, the Cluj "provincials," to peck away at the crumbs of the Bucharest banquet? On the other hand, even at the time of my doctorate dissertation I realized that molecular physics would have a great future. What did it matter that it was not a fashionable topic? At that time, isotope separation had made extraordinary progress. The most important molecular materials, heavy water, and uranium were being obtained through molecular physics processes. Was that not enough?

[Question] In 1963, the outstanding results obtained in scientific research deservedly brought you the title of corresponding member of the Academy. What can you say about the Romanian tradition in this domain?

[Answer] With the exception of a few names of first magnitude, the Romanian tradition in the atomic and nuclear field was quasi inexistent. I am thinking about Proca's contribution, about the discovery of the magneton by Stefan Popoviciu, and about Horia Hulubei's work in x-ray spectrometry. Brilliant examples, but actually exceptions. I therefore find even more extraordinary the leap achieved by the entire Romanian physics in 1955-1956, in creating the Atomic Physics Institute, in starting its nuclear reactor and cyclotron, and in creating laboratories of true international caliber in which eminent researchers have achieved recognition in a very short time. I can mention one single name among those who are no longer with us: Ion Agarbiceanu, the physicist who several months after the discovery of the laser built an operating Romanian laser. Before 1950 we had no tradition of Romanian physics such as we had for the other sciences; the explanations are easy to find. But after 1950, a Romanian physics school was created at an amazing speed, to make itself known throughout the world by the seriousness of the problems it attacked and the successes it obtained. I include in this school the Cluj physics collectives.

[Question] You have been a member of the American Nuclear Society since 1970.

[Answer] Unlike a literary work, the value of fundamental scientific work in physics is universal and not associated with any given country or nation: the language of physics is the same everywhere. By the same token, we know very well that today, in no country in the world, can physics be judged except in close relation with technical achievements and progress. It is important for us to be present at international scientific events; we show our presence, and at times our successes. But it is infinitely more important to hasten the introduction of modern physics in Romania's scientific and technical reality. What truly counts is the real scientific and technical potential of the country. It is incomparably more important to have successfully built and placed in operation nuclear power plants, even if under our present circumstances this means that we have assimilated and adapted known processes, than to publish of communicate a single paper, no matter how brilliant. And another thing. The results of current physics are the results of a great collective effort. Today's physics uses complex, complicated, and costly equipment. The great discoveries are the fruit of work carried out by large teams, and successes are created by scientific and technical endeavors that are sometimes impressive. At the present stage, Romanian physics operates under the sign of an extremely urgent task: the need for nuclear energy is most acute, and large problems must be solved in a matter of years rather than of the decades which others had available to them.

[Question] Your name is associated with two patents--in 1968 and 1969--for heavy water production processes. For the man in the street this means only one thing, nuclear explosions. To what extent do you believe scientists have in their power the means to influence the present political events throughout the world, so that the prevention, the avoidance of a nuclear war will become a reality?

[Answer] As a scientist, a physicist, who has followed from the beginning and closely the evolution of nuclear weapons and the technologic, political, and social implications of the race to increase the nuclear destructive potential, I am fully aware of the magnitude of the danger which threatens humanity. This danger is as real as can be, human civilization can be anihilated and pulverized by a single irresponsible gesture. Mankind has never been subjected to such jeopardy. That is why the catastrophy cannot be stopped by a handful of scientists, but by the united, decisive action of the huge majority of humanity. Ultimately, no one wishes to perish in a nuclear cataclysm. The scientific problem is well known in this case; what is needed now is the prevention of an act of madness, which requires the decisive involvement of the majority of humanity.

[Question] I therefore understand that the production of heavy water here in Romania, and specifically in Cluj-Napoca, cannot be a decisive argument for peace, for the generous development of science.

[Answer] The separation of heavy water from regular water remains an achievement of exceptional importance. It has opened the main path for nuclear energy in Romania, which assures our country with a very high energy independence. The heavy water industry represents an advanced technology in the nuclear field. But for those who performed this research at a laboratory scale, we must not forget that it is twenty years old. Much has changed since then. The rate of development in physics is extremely fast. In 6-10 years one field becomes outdated, another replaces it. It would therefore have been a sign of total stagnation if nothing important had been produced by the Cluj collective after completing the heavy water project.

[Question] No stagnation seems to be possible around you. One idea issues from another idea, and so forth toward other fields, other directions.

[Answer] Physics research at Cluj has grown enormously in the past two decades. Without false modesty, I believe that I have contributed decisively to this progress. In this case, my personal work is indistinguishable from that of the entire collectivity. This apparent renouncement however, has been the key for a vast action which no man alone has ever been able to achieve. New directions for research appeared one after another: separation of stable isotopes, mass spectrometry, space research, applications of solid state physics and laser technology; laboratories were created, young researchers grew up to learn and become productive, and an effort which at the start was strictly local acquired international fame.

[Question] You must continue what you started. In this respect, can you tell us about the successes recently obtained by the institute's research?

I would first mention mass spectrometry and the new processes for separating stable isotopes. Between 1965 and 1972 we developed a special technique for determining the presence of stable isotopes, using mass spectrometry. Combined with the most recent advances in molecular physics, it has led to important developments in such current applications as petrochemistry, organic

chemistry, the use of isotopes in agriculture and vegetable crops, in isotopic geology and hydrology, and so on. The Cluj-Napoca institute has become a powerful production center for these isotopes; is one of the five centers in the world which produce the most important stable isotopes for applications. Our nuclear industry, its research laboratories and production plants have achieved a great variety of models of analytical equipment, distributing throughout the country the advanced methods of the Cluj spectrometric and chromatographic analysis. A particularly spectacular application was obtained between 1973 and 1983 in space research. As part of the Intercosmos program, mass spectrometry devices have participated in five launchings aboard artificial satellites and high altitude vertical rockets; built entirely from Romanian designs, this equipment has yielded fine results, the most remarkable of which are unquestionably associated with the flight of the first Romanian astronaut, Dumitru Prunariu, who successfully experimented with a highly sensitive microbalance to determine the presence of particles newly arrived from the sun.

[Question] Since 1970, you have led as its director, the Cluj Institute for Stable Isotopes.

[Answer] The formation of the Institute for Stable Isotopes brought our collective to a superior level of organization. Since 1950, as a creation of socialism, a Cluj base for physics had been developing here, successively encompassing well defined aspects of research in this ever changing science, so as to remain up to date. At one time it was atomic physics, then the physics of isotopes, then a combination of molecular and nuclear physics, then geologic applications, then nuclear applications, and so on. And today, we witness the appearance of a new field, molecular biophysics, which is producing notable successes in our collective.

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